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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

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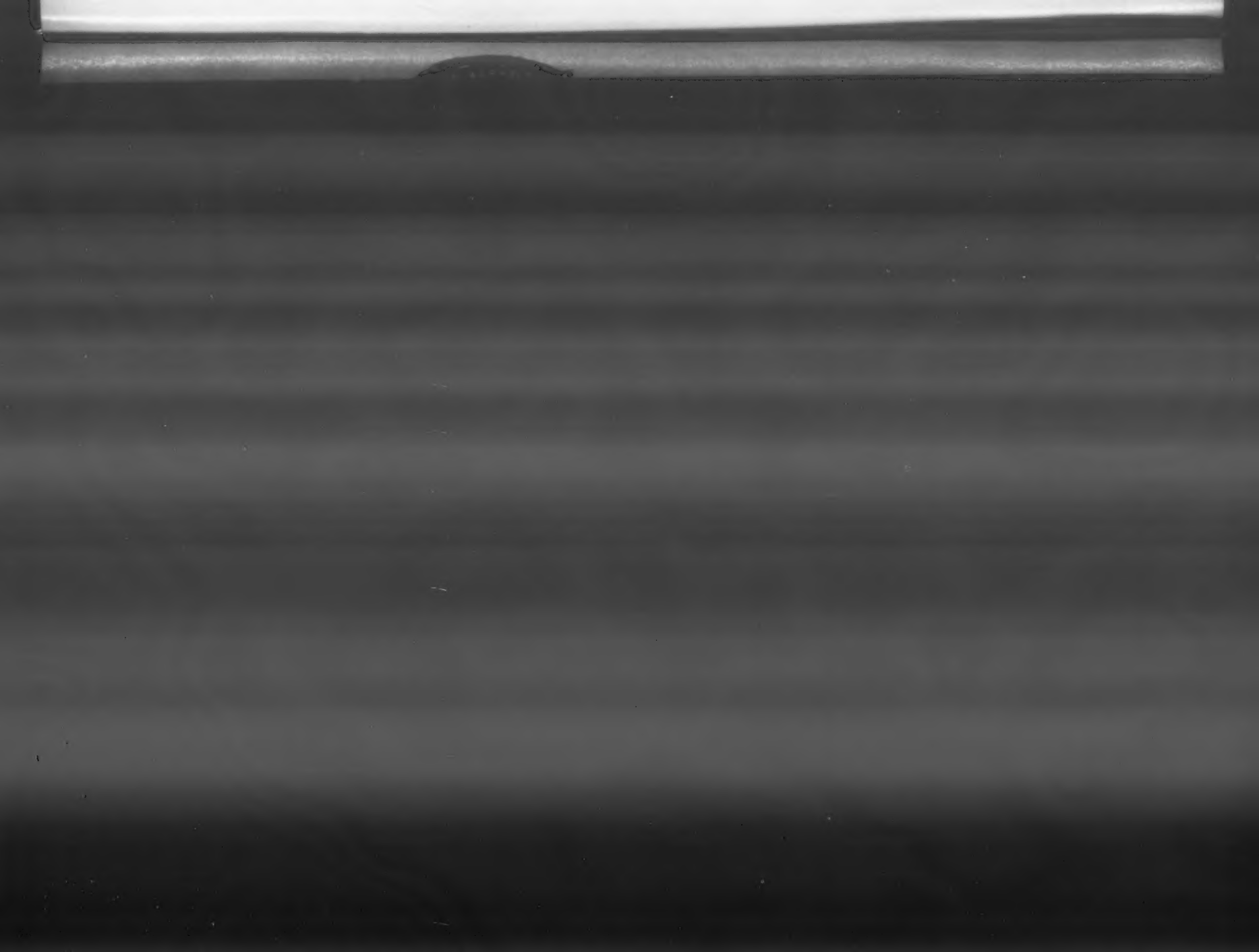


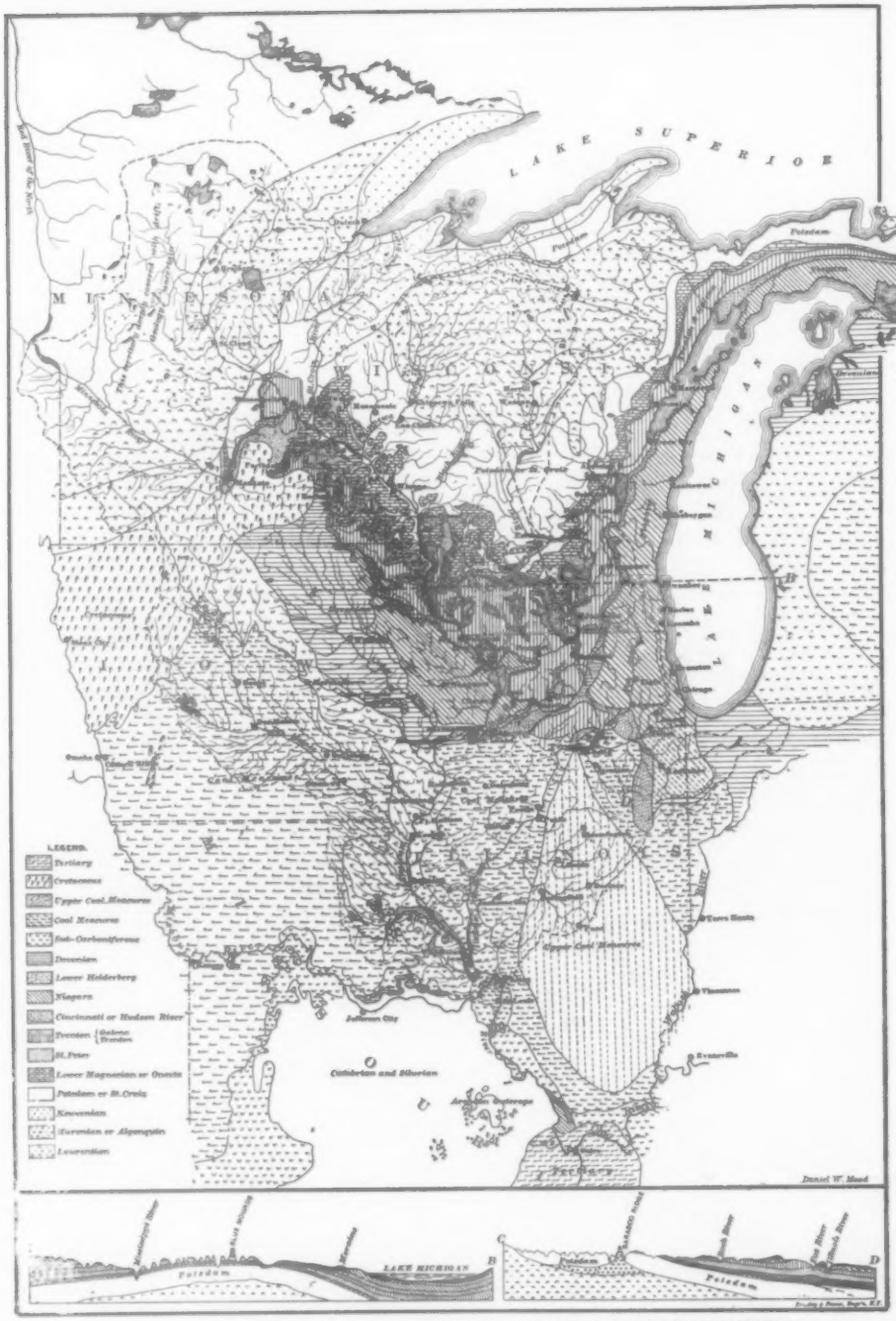
Municipal Engineering

VOLUME XVI. APRIL, EIGHTEEN NINETY-NINE. NUMBER 4.

DIFFICULT ENGINEERING PROBLEM SOLVED IN ROCKFORD'S NEW WATER-WORKS.

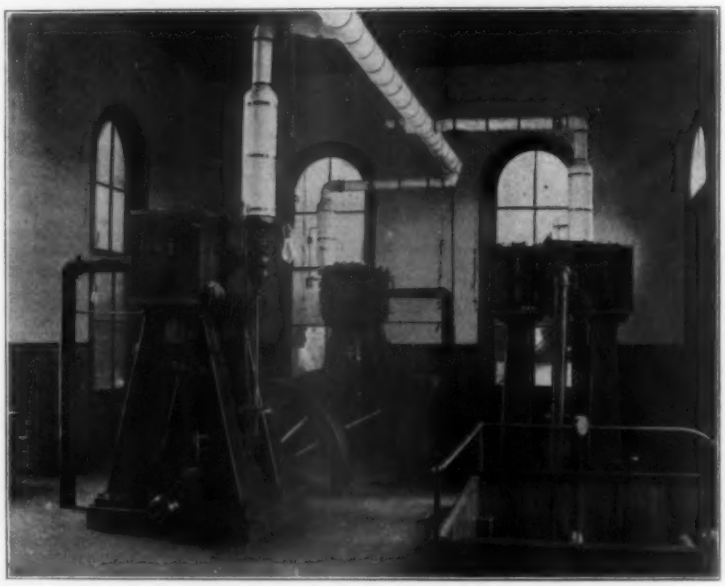
The new water supply plant designed and constructed for the city of Rockford, Ill., by Daniel W. Mead, M. Am. Soc. C. E., shows superior engineering skill. From the first he contended with what seemed at times insurmountable obstacles, but, undaunted, he worked with a determined will, never at any time doubting his ability to accomplish the results he had promised.

Rockford's original water-works was constructed in 1875, and took its supply from the Rock river. Built largely for fire protection, the use of water for domestic purposes was not recognized as an important factor. It was not long, however, until the unsanitary condition of the river above the dam polluted the water supply and endangered the health of the community. From this time until 1896 the city officials were called upon repeatedly to wrestle with the problem of providing the city with a sufficient supply of pure water. Although efforts were made to institute improvements they all proved of a temporary character. In 1896 the city council again took up the subject, and in July or August of that year Mr. Mead made a proposition to install a system that would give Rockford an ample water supply for years to come. After long and tedious discussions, during which Mr. Mead was frequently called upon to explain his plans and give assurances of his belief that he could accomplish all he proposed to do, the city entered into a contract with him, January 18, 1897, to do the work. The contract stipulated that the capacity of the system should not fall short of 5,500,000 gallons of pure artesian water every 24 hours. This contract was supplemented by an agreement, entered into August, 1897, providing for the drilling of another well and the increase of the system's capacity to 6,500,000 gallons of water per day. The general plan proposed consisted of the sinking of a vertical shaft into the stratum of clay lying below the sand and gravel deposits at the pumping works; the excavation of one or more tunnels from the bottom of the shaft to such of the wells as the contractor cared to utilize; the drilling of as many additional wells as were required to obtain the guaranteed amount of water; the erection at the base of the shaft of three pumps, each with a capacity of 3,000,000 gallons per twenty-four hours, and to be operated by engines located at the surface; the construction of brick or stone building to protect the shaft and machinery; that the shaft should be about 80 feet in depth and from 10 to 12 feet in diameter, or of such size as would be found necessary to accommodate the machinery; that it should consist of a cast-iron shell



APPROXIMATE GEOLOGICAL MAP OF THE UPPER MISSISSIPPI VALLEY, SHOWING INDURATED FORMATION.

of sufficient strength to resist the pressure of the earth, water, etc., and should be water-tight; that it should be lined inside with brick, and a suitable iron staircase should be constructed to admit of access to the pumps below; that the main tunnel should be 5 feet in internal diameter, lined with brick work, and that the lateral tunnels connecting the wells with the main tunnel should be of such size and design as necessary for efficiency. Mr. Mead sublet the contract for the shaft and tunnel work to Willard & Cornwall, of Louisville, Ky., contractors of experience in that kind of work.



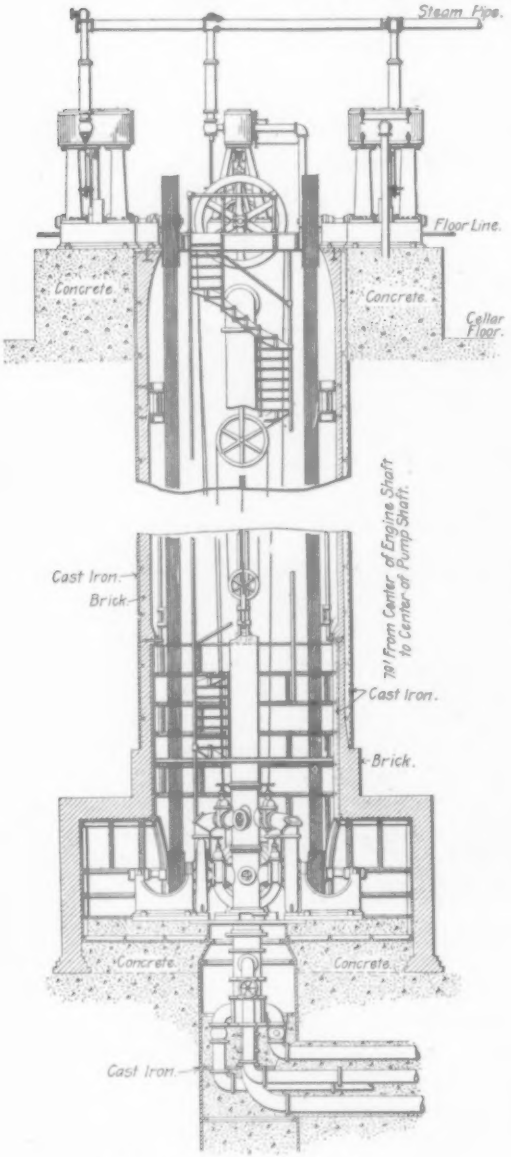
NEW ENGINE OF MEAD SYSTEM AT ROCKFORD PUMPING STATION.

The location and conditions are herewith illustrated in a map and profiles of the Upper Mississippi Valley, showing the geology of the valley in relation to the water supply of Rockford and other places in the vicinity.

In the lower right hand corner is a profile along a line from Wisconsin into Illinois through Rockford. The white portion of the map through Wisconsin represents the outcropping of the Potsdam or St. Croix sandstone, from which most of the water at this place is derived. The dotted portions represent the St. Peter sandstone, which lies above the Potsdam, and is also water-bearing. Through Illinois, at least in the immediate neighborhood of Rockford, it is deeply covered with drift. From this source a portion of the Rockford artesian water is derived.

In a general way the proposition was essentially as follows: The water from both the St. Peter and Potsdam rose to such a height that they would flow a limited quantity of water into the pumping pit. With the Pohle air-lift which was then in use, about 3,000,000 gallons of water could be pumped. The water was raised by the air-lift into a pumping pit and reservoir and is from thence pumped into the mains by a 6,000,000-gallon capacity Gaskill pumping engine. The new

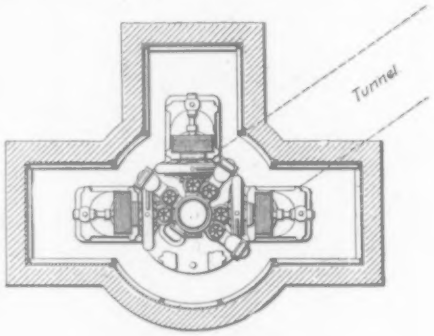
plant also raises the water only into the pumping pit and reservoir. Mr. Mead's proposition was to sink a shaft about 100 feet in depth



Vertical Section of Shaft.

and tunnel out to various wells, placing pumps at the bottom of the shaft, operated by engines at the top. By thus depressing the pumps, he expected to be able to increase the volume of water which could be obtained from the well. This he was able to do, and secured on the first test about 6,500,000 gallons. He is reaming out one of the wells and expects to increase this to 7,000,000 gallons. He has connected three deep wells, averaging in depth about 1,300 feet each; also five shallow wells into the St. Peter sandstone, averaging about 400 feet in depth.

The shaft was sunk through 55 feet of water-bearing sand and gravel into a poor quality of clay. The shaft was built of cast iron

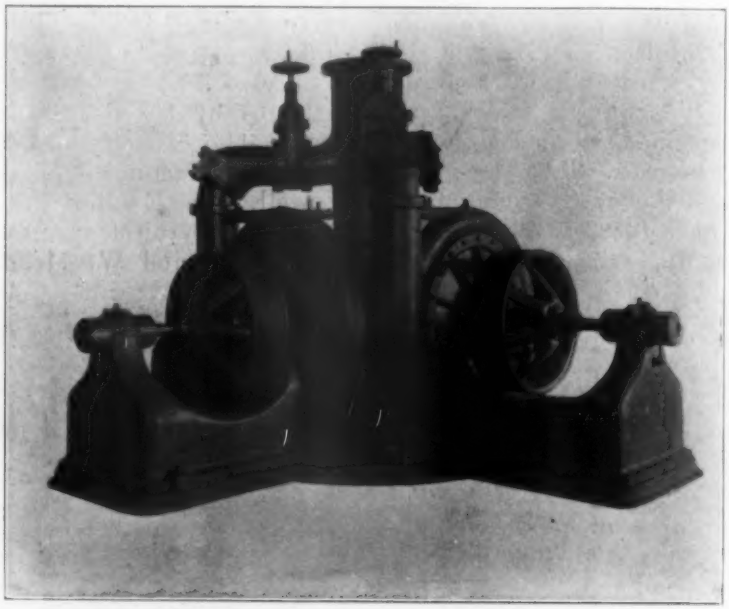


Section of Shaft showing arrangement of Pumps.

sections, lined with 8 inches of brick work, and was sunk under pneumatic pressure. At a depth of 80 feet the alcoves for the pumps were constructed, after which the air lock was removed with the expectation of the contractors being able to sink the small shaft and drive the tunnel in open work.

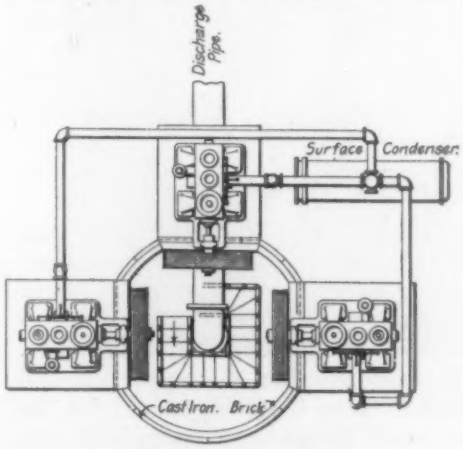
While sinking this small shaft, water was encountered at a depth of about 100 feet below the surface, and the water rose to within about 10 feet of the surface. At this point Willard & Cornwall threw up their contract, leaving the work for Mr. Mead to finish. Mr. Mead put in a new air lock about 30 feet below the top of the shaft, lowering the

water by pumping, and when he got the pressure on was able to blow out the water and drive the tunnels.



CENTRIFUGAL PUMPS ASSEMBLED BEFORE PLACED IN PIT.

A great many mishaps were encountered in the construction of the work. The clay was full of sand seams and much water was encountered. The last run of tunnel had a clay roof of only about 4 feet, above which was 90 feet of water bearing sand and gravel. For about eight months the work was prosecuted under pressure varying from 35 to 42 pounds. The work of tunneling was completed about May, 1898, and the engines were installed about the first of August.



Plan of Shaft
showing arrangement of Engines.

Owing to various delays, however, the plant was not completed and tested until the latter part of December of 1898, although it was pumping water for the city from about the middle of August. On test the pumps worked under an 80-foot discharge head with the suction measured at the pumps of 26 feet, making a total lift of 106 feet. The pumps were tested under various loads and have given extraordinary results. Under various conditions from indicated horse-power of the engines to the actual horse-power of water raised, efficiencies of from 65 to 70 per cent. have been obtained, the pumps also giving efficiencies of from 70 to very nearly 75 per cent., the great

efficiencies being on the high lift. Mr. Mead believes these results are unprecedented in high lift centrifugal pump work. The pump impellers are of the hollow type, are made of bronze, cast in sections and very carefully worked out through the runners so that the water spaces are all perfectly true and very smooth. The centrifugal pumps and the vertical compound engines were furnished by the Byron Jackson Machine Company, of San Francisco, Cal. A Worthington surface condenser was also set in the pit, as shown in the illustration.

In the test the engines ran at the average rate of 200 revolutions per minute, producing water at the rate of 6,750,000 gallons per 24 hours. A duty of 58,000,000 feet lbs. per 1000 lbs. of dry steam was developed. The capacity and efficiency tests were made by William M. Stowell, M. E., for the city of Rockford, Byron Jackson for himself, and Daniel W. Mead in his own interest.

MOTOR CARRIAGES AND STREET PAVING.

By Thomas Conyngton.

The number of motor vehicles already in use in this country and elsewhere indicates clearly that their general introduction is but a matter of time. In Europe they are much more common than here. In Paris, on occasion, the fashionable drives will show almost as many motor carriages as vehicles of the ordinary build, and in other European cities the prohibition of horses on certain drives is under serious consideration. In England and in France several periodicals in the interest of motor vehicles are regularly published, and the nature of their contents and the appearance of their advertising pages indicate that they are successfully filling a popular demand. In the United States one attractive monthly is devoted to this subject.

It will be remembered that in this country much attention was called to certain public trials of motor vehicles, both at Chicago and New York, in which the results, though not entirely conclusive, were very encouraging. In New York City the public have been served with electric cabs for two years or more. These cabs, though at first apparently constructed on the lines of a steam road-roller, have been fairly successful and in their present more attractive form are now well patronized. The public have become so accustomed to their smooth and noiseless passage through the streets that they attract hardly more attention than do the old Fifth avenue busses. Quite frequently, too, on the residence streets and on the fashionable drives, lighter and more elegant motor carriages may be seen, holding their swift and easy course among and through the heavier and equine-cumbered equipages of the avenues.

Within the last twelve months much greater progress has been made in the introduction of these harbingers of an advanced civilization than appears on the surface. A large number of companies and firms have been organized for the express purpose of manufacturing these carriages and bringing them into general use. At the present

THE CITY HALL AND A GENERAL VIEW OF ALBANY, N. Y.

time there are in this country more than forty separate organizations working toward these ends, each with its own special carriage or motor and each bent upon the speedy exploitation of their particular machine. One prominent manufacturer whose singularly accurate judgment in regard to the future of the bicycle has brought him fame and money, is reputed to have secured contracts on several of the most valuable European patents, and his company is already in the market with a high-priced but very successful motor carriage. Also quite recently much speculation has been caused by the appearance, apparently in conjunction, of Mr. Leiter, of wheat-corner fame, and Mr. Croker, of Tammany, in the new field of automobile conveyance. Beyond all this, and perhaps even more significant, the motor carriage has risen from its former position in the popular judgment as an expensive fad to that of the coming conveyance.

With the variety of machines that are now being offered, or about to be offered, there is a remarkable diversity of motor power. Most of the carriages use petroleum or gasolene motors, cheap to operate and very effective, but a little odorous and occasionally troublesome to manage. Some experts declare in favor of a lightly constructed steam engine, while a larger number favor the use of electricity, with its necessary accompaniment of heavy, cumbrous and troublesome storage batteries. Lately organized companies are to be operated by compressed air. Beyond all this are many rumors of motors yet to come, using various kinds of gases, combustibles and even explosives.

The future of the motor carriage demands some imagination. This generation has seen the telephone, the electric motor, the electric light, the bicycle, and hundreds of lesser inventions, almost revolutionize existing conditions. In view of what has been done, and of the present status of the motor carriage, and of the field that is open to it, the anticipation of its widest and most general introduction does not seem unreasonable. There are no fundamental patents controlling these machines and restricting their general manufacture and sale. True, hundreds of patents have been issued, and more hundreds will be issued, but it is possible to-day for a skilled mechanic to build a practical and successful motor vehicle without infringing any of the existing patents, just as he can build a steam engine, or a bicycle, or a mowing machine. This means that there will be no monopoly of the business, but that the machines will be put on the open market to be sold on their merits and at reasonable prices.

At present the price of the motor carriage ranges from $500 up well into the thousands. As soon as the scale of manufacture is sufficiently increased to permit the parts being made by machinery and in quantity, these prices will undoubtedly be very greatly reduced, probably to such a figure that the man of very moderate means will be able to maintain his own motor carriage without even suspicion of extravagance.

The general introduction of these vehicles would work an industrial revolution. The horse and the industries dependent upon his use would almost pass away. New factories, new repair problems, and the greater skill required in the constructive and repair work of these machines, would call into activity an immense number of

A COBBLESTONE PAVEMENT ON SECOND STREET, ALBANY, N. Y., AS IT APPEARED JUST BEFORE REPAVING WITH BRICK.

skilled operatives, with a correspondingly increased scale of wages.

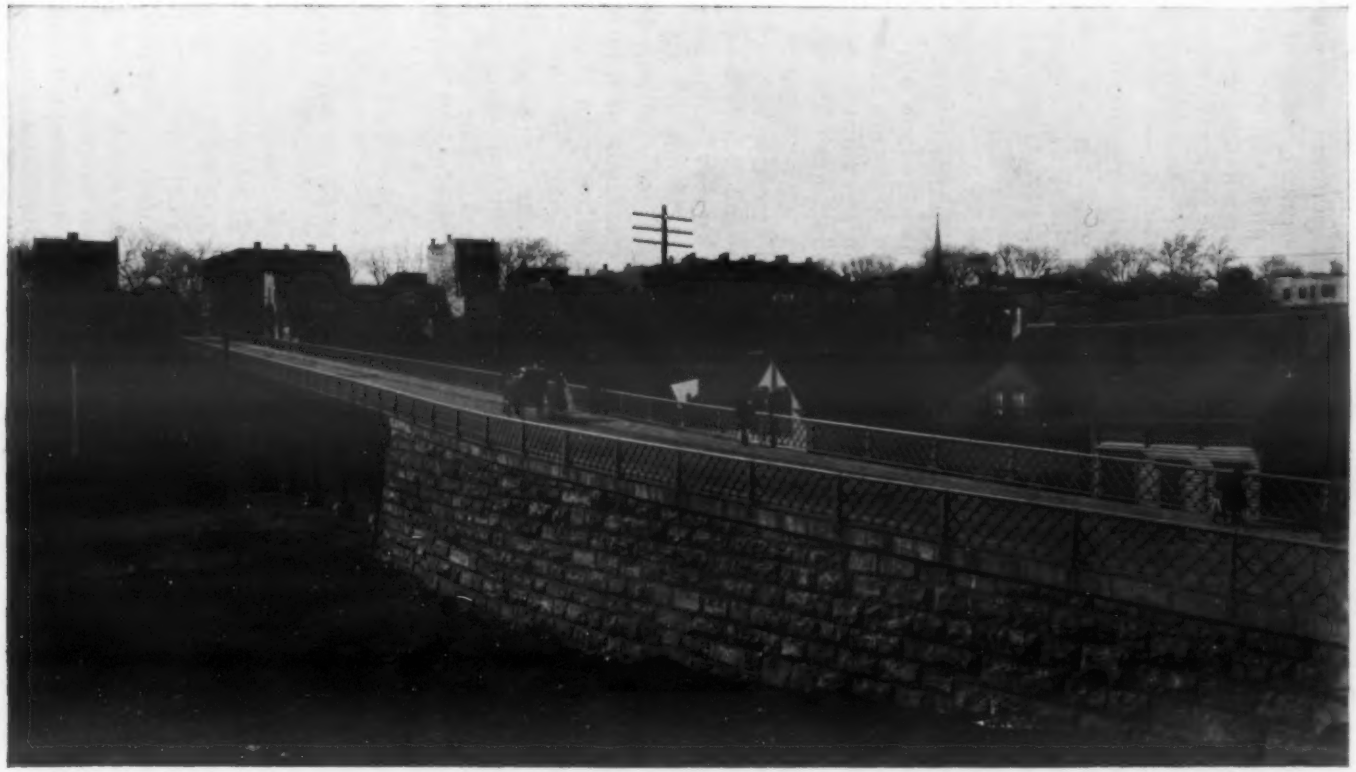
The most interesting phase of this question is, however, the effect produced by the general use of motor vehicles upon the ever-present and very important problems of street paving, maintenance and cleaning. At present the effect of the horse's hoof on paved surfaces is one of the most serious difficulties confronting the municipal engineer. If an effectual method of destroying our streets were desired, it is doubtful whether anything better could be devised than the hammering, cutting, twisting and grinding of a horse's feet. Take a ponderous draft horse, weighing close to a ton, shoe his four feet with heavy, sharp-cornered, iron plates as a traction base, harness him to a heavy truck, put on a heavier load and then start him pounding, denting, twisting and scraping from morning to night and you have a very efficient engine of destruction. All of our paving construction is largely affected by this factor. The granite block pavement with all its variations, has no other *raison d'etre* for its existence. Asphalt, paving brick and the other modern pavements are very greatly modified by the necessity of guarding against the destructive action of the horse's hoof.

Nearly all the repairs required by the modern pavement are due to this cause and in a lesser degree to the iron-tired wagon wheels with their angular edges. The hardest granite blocks grind off until too uneven for use and are then either re-surfaced with asphalt or relaid. Paving brick wear out and where there is the slightest softness go to pieces. Wherever a weak spot occurs in the asphalt it is found out by the hoofs of horses, and the pavement is only preserved by the most constant maintenance; while macadam streets and roads can hardly be maintained in even tolerable condition.

It is further true that nearly all the sanitary difficulties of our streets are caused by the use of the horse. The constant accumulation of filth and the continual mud or dust resulting from attrition, demand constant and unflagging attention to keep our streets in even passably decent condition. Nearly all these ills of dust and mud and evil odors, with their unhappy effects on the health and temper of the residents, are to be charged to the use of the horse.

With this state of affairs may be contrasted the conditions that would exist with the general use of motor vehicles. It is possible that this will eventually result in the legal prohibition of horses on our business thoroughfares, with an immediate and most important change in the construction of our street pavements. Granite and stone blocks in all their forms would be abolished. Paving brick would be laid on lighter foundations and with greater smoothness. Asphalt, above all else, would be the predominant pavement, perhaps more lightly laid and at less cost; macadam and gravel, rolled as smoothly as possibe and disturbed by nothing more injurious than a rubber tire, would develop possibilities now undreamed of. Even an ordinary dirt road, properly graded, rolled down and drained, would be very tolerable in all except the very worst of weather.

The improvement in city conditions by the general adoption of the motor carriage can hardly be overestimated. Streets, clean, dustless and odorless, with light, rubber-



THE NEW KNOX STREET VIADUCT AT ALBANY, N. Y.

tired vehicles moving swiftly and noiselessly over their smooth expanse, would eliminate a greater part of the nervousness, distraction and strain of modern metropolitan life. Not only would the improved street conditions contribute to better health, but also the existence of this ideal vehicle, light, rapid, powerful, easily handled, economical in operation, reasonable in its first cost and cheaply kept and maintained, would in itself greatly increase outdoor exercise of the most agreeable and healthful kind with resulting benefit to both physical and mental man. May the day soon come.

SECRETS OF SUCCESS IN MAKING GOOD PAVING BRICK.*

By F. Plumb, a Manufacturer.

In all the pursuits of men there is room for improvement. The manufacture of paving brick furnishes no exception to this general rule. Even now the situation demands better brick for paving uses; better brick than we are making; better brick than we ever knew how to make. We are doing well. In the last six or eight years we have improved the quality of our output very much. We understand our clays and shales better. We know more about proper grinding and screening, about burning and about cooling, to secure durability and toughness; yet the goal of that which is required and attainable has not been reached.

Our competitors for public approval in street paving are granite and asphalt. We must, as far as practicable, get the good qualities of our competitors and discard the bad.

That which most recommends granite is its durability in use. That which most recommends asphalt is its smoothness and noiseless quality in use. Granite is noisy and hard on animals and vehicles. Asphalt is slippery and easily worn out with heavy traffic.

It then follows that we need a brick that shall furnish a smooth street surface to compete with asphalt in its best features, and a brick that possesses more of the toughness and hardness characteristic of granite than any we are yet making.

The more important of the above requirements is hardness and toughness. How shall these be secured? Will it be by finer grinding and closer screening, and this then to be followed by greater care in burning and then longer time in cooling? Who has exhausted these problems, so that he can say the best processes have been found out? To do any one or all of the above will cost money, but a better brick will justify the outlay. We have been running up and down the gamut of size and shape in this matter, but have found, as yet, no peace.

I well remember when a paving block was manufactured and put down in this city and elsewhere, which block was four by five by twelve inches, having a total of 240 cubic inches. This block was found to be too large. It was not always properly burned, on account

* Paper read before Illinois Association of Clay Workers at Annual Meeting for 1899 in Peoria.

of its great size. Such blocks are not popular now. We have retreated from that size until now a good, acceptable brick has little more than one-third the cubic inches found in the large block.

The value of repressing has recently received a set-back by an article in which it is claimed with some of our clays a side-cut brick is injured by repressing. The experiments made by Professor Orton, of Ohio, and the remarks of Professor Wheelock, of Missouri, in that article, based, as they seem to have been, on rattler tests, go to show that there is an induced lamination given to the side-cut block by the repress. We are, then, finding out that the wearing quality is not in the large block, nor is it necessarily in the repress. It is much more likely to be found in some of the other processes. Somewhere along here, by experiment, we shall find a brick that will have all of the essential wearing qualities of granite. When that is done the future of the paving is secure against the attack of any of its present competitors. At best these discussions can only suggest the field in which these improvements are to be made.

We may find that, when repressing the side-cut block, it must go into the mold on its edge. We may find that rounded corners had better be dispensed with. We may run counter to the set notions and demands of some of our city engineers who write specifications for street paving. City engineers have much yet to learn, in common with us. We shall make discoveries that will disturb pet ideas.

I have great respect for the rattler test and the crushing test, but somehow it seems to me that the absorption test may be somewhat misleading as to the real value of a brick. A block of glass would show well in the absorption test, but be so brittle as to be valueless for paving uses.

Let us not be disturbed if we finally get back to a brick the size of a common builder, and made on the side-cut plan, without having been through the repress.

Let me ask who can tell us how fine our shale should be ground to get the best results? Who, by actual experiment and observation, has gone to the bottom of this question? Do you get better brick by a complete and thorough course in the dryer? or is it just as well to send the brick from the dryer to the kiln, with the brick partially dried out? Is slow watersmoking better for the quality of the brick than rapid? Which one of the two? When brick are burned, is two weeks' cooling better than one week? and would three weeks be better yet? Who can give us the bottom facts here?

A word as to materials. Many of the shale pits where our material is taken from show a marked difference in character and quality in the various layers that go to make up the whole mass. We have undertaken to mingle the whole mass together by cutting from top to bottom of the bluff. This is undoubtedly a proper thing to do. Now, how thoroughly should this be done? Are the ordinary methods of grinding and mingling all that is needed to get the best results? Would there be any value to be had in grinding our clay and let it stand in a mass several weeks or even months before sending it to the mill?

The past has demonstrated our ability to improve. That we shall make great strides for the better I am confident, and our greatest achievements in this direction will be found in the line of simplicity and painstaking methods.

THE PRODUCTION OF ASPHALTUM.

In the nineteenth annual report of the United States Geological Survey covering the year 1897, which has just been issued, Mr. Edward W. Parker gives the information gathered by him on the production and use of asphalt in the United States up to the beginning of 1898. It is regrettable that the department is unable to publish the information gathered for its reports until over a year after its compilation.

The reports on asphaltum include all of the many varieties of bitumens which are produced on a commercial scale, embracing those known as maltha, bituminous rock, albertite, elaterite, gilsonite, wurtzelite, litho-carbon, etc., as shown in the following table, since 1882:

Production of asphaltum and bituminous rock from 1882 to 1897.

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1882	3,000	$10,500	1890	40,841	$190,416
1883	3,000	10,508	1891	45,054	242,264
1884	3,000	10,500	1892	57,690	445,375
1885	3,000	10,500	1893	47,779	372,232
1886	3,500	14,000	1894	60,570	353,400
1887	4,000	16,000	1895	68,163	346,281
1888	50,450	187,500	1896	80,503	577,563
1889	51,735	171,537	1897	75,945	654,632

While the production was less in quantity in 1897 than in the preceding year, the value was considerably increased, and was the largest in the history of the business. This increase was not due to any advance in values, but to the increase in the production of hard, gum, or refined bitumen, and an increase also in the output of maltha or brea, which sells for a higher price than the ordinary crude asphaltum and bituminous rock, all varieties of which showed a decreased production. Crude asphaltum, for instance, showed a decrease in production from 6,500 tons in 1896 to 5,971 tons in 1897, while the average price per ton was practically the same, there being only a difference of 4 cents in the two years. The production of bituminous sandstone decreased from 56,971 short tons in 1896 to 48,801 tons in 1897. The average price per ton of this product increased from $3 to $3.25. In the production of bituminous limestone there was a decrease of over 50 per cent., from 4,300 tons in 1896 to 2,100 tons in 1897, with a difference of only half a cent in the average price per ton. The increases were in the production of mastic, liquid asphaltum, and in that of hard and refined "gum" asphaltum. In the latter are included "gilsonite" from Colorado and Utah, hard "Ventura" asphaltum from Ventura county, California, and all gum or solid bitumen refined before being sold. The production of liquid asphaltum increased a little over 50 per cent., from 9,510 tons in 1896 to 14,650 tons in 1897. The average price fell from $22.50 per ton to $21.25. The production of hard and refined asphaltum increased from 3,122 short tons in 1896 to 3,940 tons in 1897. The increase in value was from $92,240 to $102,000, indicating a decrease in the average price per ton. This decline was from $29.58 in 1896 to $26 in 1897.

The amount of asphaltum sold in the form of "mastic" (that is, ground or masticated, heated, and pressed into blocks for convenient shipment) increased from 100 tons in 1896 to 483 tons in 1897. The average price per ton was $9 in 1896, and a little over $20 in 1897, the increase in price being due to a product of this material reported from California in 1897 on which

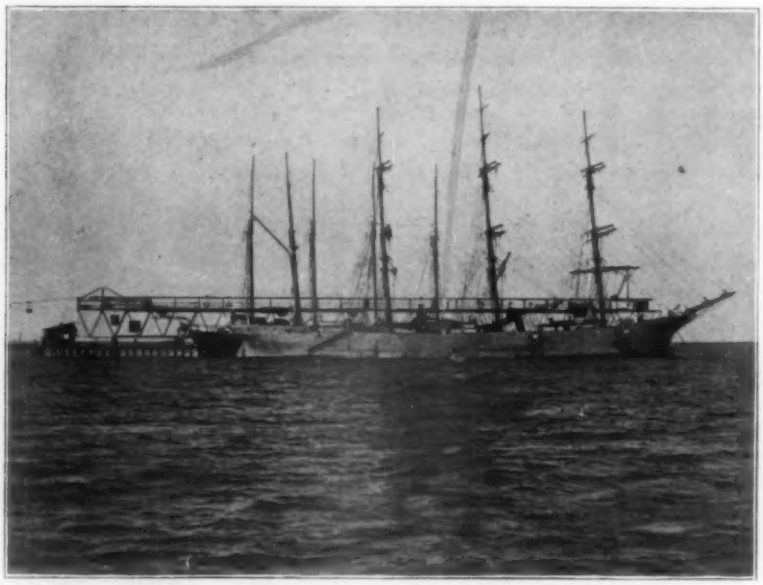
a higher value was placed. No mastic was reported from California in 1896. The comparative increase in value was, therefore, in spite of lower prices instead of because of higher values. If the prices for maltha and hard asphaltum had been the same in 1897 as in 1896, the value would have increased about $32,400, so that comparatively there was a decrease of about $20,000. The higher value of mastic in 1897 partly offset this decrease, but, taken at the same prices for all kinds as obtained in 1896, the value in 1897 would have been nearly $675,000, instead of $664,632.

The amount and value of asphaltum production is shown by states for four years as follows:

Production of asphaltum since 1894, by States.

State.	1894.		1895.		1896.		1897.	
	Short tons.	Value.	Short tons.	Value.	Short tons.	Value.	Short tons.	Value.
California	54,107	$351,691	64,048	$320,240	74,671	$485,355	68,250	$566,325
Kentucky	3,000	21,000	2,250	11,250	.....	.....	2,250	22,250
Indian Territory, Oklahoma, and Texas	a3,000	45,000	a1,650	24,750	b3,000	45,000	500	7,500
Colorado and Utah	1,000	15,000	700	10,500	1,170	16,380	1,700	27,557
Total	61,270	$464,691	68,148	$466,740	78,841	$577,735	72,700	$664,632

a Texas only. b Indian Territory and Texas.



LOADING ASPHALT AT BRIGHTON, ISLAND OF TRINIDAD.

In value the asphaltum from California represented a fraction less than 90 per cent. During the last four years the average proportion of California's product to the total has been the same as in 1897—90 per cent. The lowest proportion was in 1894, when California produced 84.5 per cent.; the highest in 1895, with 95.4 per cent. In value California has produced an average of 84 per cent. during four years.

There are six counties in the state in which asphaltum is mined —Kern, Monterey, San Luis Obispo, Santa Barbara, Santa Cruz and Ventura. They are all in the southern half of the state, and all except Kern county border on the ocean, and in some cases the asphaltum deposits are close to the shore, so that the product can be loaded into vessels directly from the mine. Hard asphaltum is produced in Santa Barbara and Ventura counties. Liquid asphaltum, or maltha, is produced in Santa Barbara and Kern counties; and

the product from the other three counties is bituminous rock. The liquid asphaltum is used as a flux in reducing the harder varieties to the proper consistency for cementing purposes. For this purpose it is claimed to be very superior to coal tar and petroleum residuum.

VIEW OF PITCH LAKE, ISLAND OF TRINIDAD.

The importations of asphaltum for use in the United States are largely from the island of Trinidad. The following table shows the sources of importations for 1897:

Imports of asphaltum during the fiscal year 1897, with the countries from which exported.

Country	Long tons.	Value.
West Indies:		
British (Trinidad)	86,094	$199,795
Danish	400	2,000
Spanish (Cuba)	225	4,189
Italy (probably including Switzerland)	16,991	77,456
Venezuela (Bermudez)	15,997	75,945
Germany	6,826	35,866
France	861	3,227
Mexico	273	5,802
Turkey in Asia	31	3,439
Great Britain	11	309
United States of Colombia	3	130
Canada	2	6
Total	128,123	395,554

The report states that "the shipments of lake pitch for the last nine years have averaged over 80,000 tons per year. The flow into the lake is at the rate of about 20,000 tons per year, so that the renewal of supply is less than one-fourth the amount taken out. The depth of the lake, however, is about 135 feet at the center, and considering the extent of the deposit, there need be little apprehension of the early exhaustion of asphaltum."

Mr. O. E. Thurber, treasurer of the New Trinidad Lake Asphalt Co., Ltd., of New York city, furnishes the bureau the following statement of the exports of both lake and land asphalt from Trinidad, from 1886 to 1897 inclusive:

Total exports of all asphalt from Trinidad, 1886 to 1897, inclusive.

Year.	To United States			To Europe.			To other countries.			Grand total.
	Lake.	Land.	Total.	Lake.	Land.	Total.	Lake.	Land.	Total.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1886	23,235	2,397	34,633	13,321	.....	13,321	.....	.....	.....	37,742
1887	31,915	4,048	35,960	10,491	220	10,491	.....	.....	.....	45,341
1888	34,121	7,620	41,941	20,617	619	21,436	.....	.....	.....	63,377
1889	65,410	13,560	80,970	23,720	.....	23,720	.....	330	330	95,020
1890	69,997	17,417	87,334	28,691	.....	28,691	630	.....	630	94,975
1891	55,148	26,517	71,027	24,927	120	25,070	361	69	361	96,044
1892	76,998	17,645	89,212	25,722	699	26,402	1,076	.....	1,076	116,779
1893	65,426	3,450	68,876	29,615	5,225	35,040	.....	192	197	93,163
1894	71,999	3,051	75,743	23,695	8,249	32,235	.....	164	164	108,202
1895	66,676	4,744	69,720	16,194	5,322	21,426	.....	294	294	91,440
1896	69,457	13,040	72,686	23,294	5,824	34,215	1,000	.....	1,000	96,979
1897	74,467	19,345	93,630	34,533	1,345	35,182	680	661	1,396	130,511
Total	916,439	130,569	1,046,910	286,162	28,000	350,762	3,360	3,360	7,203	1,404,844

Later information from other sources, as to the domestic production, shows that there were no new sources of supply in 1898. California continued to be the only producer of asphaltum proper, according to the ordinary classification. Bituminous sandstone was produced in California and Kentucky; asphaltic limestone in Utah and the Indian Territory. Grahamite, or gilsonite as it is more commonly (although improperly) known, was mined in Utah and Colorado, the latter state being a new source of supply, although the existence of deposits there was previously known. A new discovery of ozokerite was reported from Utah, but there was no production of this substance in the United States in 1898, and it does not seem likely that there will be so long as the Galician mineral can be laid down in New York so much more cheaply than that from Utah. As heretofore, the chief domestic supply of asphaltum for paving material was obtained from Trinidad. A considerable quantity of "manjak," a high-grade bitumen, was brought to New York from Barbadoes. Although the statistics of the California production in 1898 have not yet been compiled, it is believed that it will be found to be less than in 1897, as there was less paving done in 1898 than in the previous year.

WAYNE STREET, SANDUSKY, O., PAVED WITH ASPHALT BLOCK.

GROWTH OF THE PORTLAND CEMENT INDUSTRY.

The Portland cement manufactured in the United States in 1897, according to the information compiled by Mr. Spencer B. Newberry, for the United States Geological Bureau, amounted to 2,677,775 barrels, an increase of 1,134,752 barrels, or nearly 74 per cent. over

the product of the previous year. While this growth is fairly well distributed over the country, it is most marked in the Lehigh Valley region in Pennsylvania, which produces most of the Portland cement made in this country. The relative delopment of the industry in different sections of the United States since 1890 is shown in the following table:

Table showing development of Portland cement industry in the United States since 1890.

Section.	1890.			1894.			1897.		
	Number of works.	Product.	Per cent.	Number of works.	Product.	Per cent.	Number of works.	Product.	Per cent.
		Barrels.			Barrels.			Barrels.	
New York	4	65,000	19.4	6	137,976	14.7	7	894,389	14.2
Lehigh County, Pa., and Philipsburg, N. J.	5	201,000	60.0	7	685,228	60.8	5	3,092,039	74.6
Ohio	2	22,000	6.5	4	89,653	10.1	4	146,452	5.5
All other sections	5	47,500	14.1	9	115,500	14.4	10	134,893	5.6
Total	16	335,500	100.0	24	796,757	100.0	29	3,677,775	100.0

The imports of Portland cement in 1897 were 2,090,924 barrels, a decrease of 898,673 barrels from the preceding year. The percentage of the total consumption of Portland cement in the United States, compared with imports, increased from 13.2 in 1891 to 56.8 in 1897. Mr. Newberry says:

"Considerably more than half the Portland cement consumed in 1897 was of American manufacture. This important step toward the replacement of imported by domestic Portland has been largely brought about by the successful efforts of American manufacturers to produce a high-grade product. Engineers in all parts of the country are finding, to their surprise, that the product of the leading American factories shows decidedly higher tests than the imported brands which have long been regarded as a standard. This is strikingly shown in the reports of Mr. Richard L. Humphrey, inspector of cements for the city of Philadelphia. These reports are included in the annual messages of the mayor of Philadelphia. The average of all American Portlands tested in 1896 and 1897 is decidedly higher, both neat and with sand, than that of all the English or German Portlands tested. In fineness of grinding also the American cements were found superior to the imported. It is gratifying to find that an industry so new to this country, and one requiring so high a degree of technical knowledge, has already been developed to a point beyond that which it has reached in England and Germany."

Mr. Uriah Cummings reports that the production of American rock cement in 1897 was 8,311,688 barrels, or 4.28 per cent. more than in 1896, but the value fell from $4,049,202 to $3,862,392.

Reports for 1898 show a large increase in the consumption of Portland cement. The increase is attributable to the large requirements of the government and extensive construction of public works. Notwithstanding the large increase in the domestic demand the importation of foreign Portland cement fell off from 2,787,760 bbls. in 1897, to about 1,700,000 bbls. in 1898, which shows the extent to which American producers now control the Portland cement business of this country. The existing conditions led to an increase in prices, and American Portland cement ranged between $1.90 and $2.25 per bbl. in New York during the year. Imported cement sold at $2.10 and $2.25, against $1.90 and $2.10 in 1897. The growing demand has stimulated the industry, and a number of new plants have been started, while many of the established plants have largely increased their facilities.

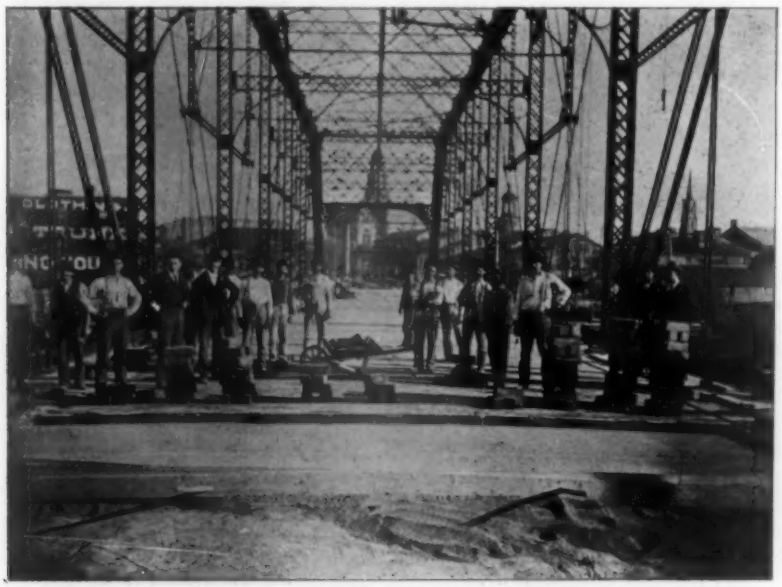
CLARIFICATION OF RIVER WATERS.*

By Allen Hazen, C. E.

Neither storage nor sedimentation is capable of adequately removing mud from water. The process can only be finished by filtration. Two methods of filtration have been extensively used for this purpose. These are known as sand and mechanical filtration. They differ principally in that the rate of filtration with mechanical filtration is many times greater, and that the process is assisted by the use of coagulant, which forms a flocculent precipitate in the water, which draws the particles of sediment together and allows them to be more readily removed by filtration.

With either sand or mechanical filtration the difficulty in treatment, as I shall show, increases nearly in direct proportion to the turbidity, and it is thus highly important to secure a water for filtration with as little turbidity as possible, and thus to develop to their economical limits the preliminary processes of storage and sedimentation.

Let us consider the nature of the agencies which in filtration lead to the removal of turbidity. First there is the straining action, which consists in stopping particles too large to go through the passages in the filter. Straining is an important element in filtration, but it is never adequate in itself. If the passages of a filter are made so small as to stop even tolerably well the finest particles of sediment, they are so small as to make it impracticable to get adequate quantities of water through them. Any filter which acts as a strainer only can remove only the larger parti-

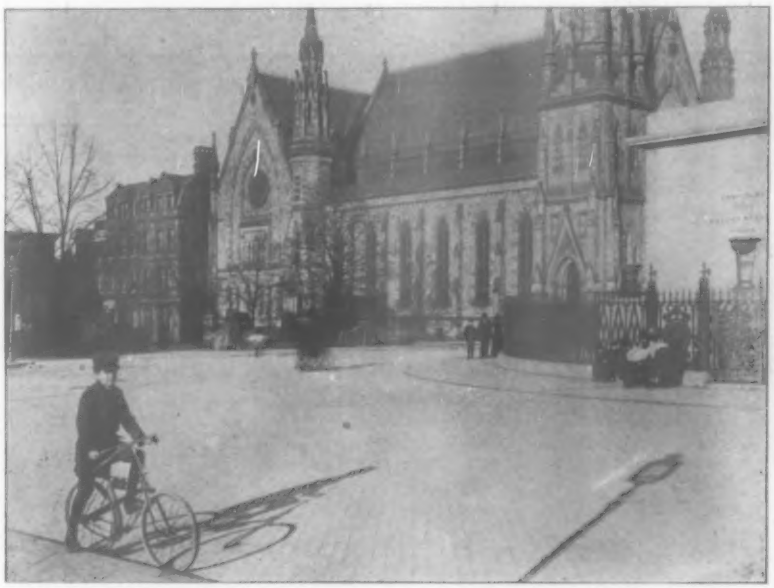


PAVING ROADWAY OF MAIN AND HIGH STREET BRIDGE, HAMILTON, O., WITH ASPHALT BLOCK.

*From paper read before the Franklin Institute of Pennsylvania.

cles, and not the smaller ones, which so largely constitute the turbidity.

The next agency of importance in the work is adhesion. When the particles of suspended matters are carried into contact with the filtering material, many of them get close enough to it to adhere to it and remain fixed while the water flows on without them. Closely connected with adhesion, but differing from it, is, third, sedimentation taking place in the pores of the filter. In the removal of suspended matters from water by sedimentation, we may assume that owing to its weight and the viscosity of the water, each particle will make a certain rate of progress downward through the water. With the smaller particles this rate of progress is extremely slow, and with a sedimentation basin several feet deep many days may be required for a particle to reach the bottom, and in fact its progress may be entirely offset by currents in the sedimentation basin, resulting from the action of the wind or from temperature changes, which constantly mix the water up from top to bottom and absolutely prevent the deposit of the finest particles. With a sedimentation basin that is not so deep, the improvement in a given time becomes greater, owing to the shorter courses for the particles. If it is filled with coarse gravel or other loose material through which the water very slowly flows, particles have to settle only to the first stone or other obstruction with which they come in contact, and the lengths of the courses of the particles are greatly reduced and the improvement correspondingly increased. It thus happens that by putting water through even quite a coarse material, so coarse that no straining whatever can be conceived as taking place in it, the improvement in its appearance may nevertheless be quite marked.



MT. VERNON PLACE, BALTIMORE, MD., PAVED WITH ASPHALT BLOCK.

In a filter the conditions for sedimentation are still further greatly improved. The spaces between the sand grains are extremely small, and the course of a particle from any point in the interstices to the sand grains next below is very short, and when a particle strikes bottom it is perhaps assisted in remaining there by adhesion, especially where the grains of filter sand have accumulated organic growths more or less sticky in their natures.

PARK AVENUE, WARREN, OHIO, BEFORE PAVING.

Sedimentation in the filter beds thus becomes an important factor in clarification.

It is essential for these processes that the rate of filtration shall not be so great as to sweep the particles forward when they come in contact with particles of the filtering material instead of allowing them to remain upon them.

These three agencies constitute the clarifying power in sand filtration without coagulant. In mechanical filtration the rate of filtration is greatly increased, and all of them, and especially the last two, are very much limited in their action. The velocity of flow is so great as not to allow of either sedimentation or adhesion, or at least not in anything like the degree in which they operate in sand filtration. On the other hand, a new agency is introduced, which is the fourth on our list, namely, coagulation.

The most common and successful coagulant is sulphate of alumina. Waters to be treated with it generally contain lime in solution as calcium carbonate. This reacts with the sulphate of alumina, forming calcium sulphate, which remains in solution, and aluminum hydrate, which forms a flocculent precipitate which surrounds and gathers together the finest particles in the water and forms them into aggregates which are removed by straining much more readily than the separate particles can be re-

moved. The characteristic feature of filtration with coagulants consists in gathering the particles into aggregates and removing them as such.

One of the essential features of success in the use of coagulant is that the raw water shall contain more than enough lime to decompose the sulphate of alumina applied. The flood-flows require much larger quantities of coagulant for their clarification than do the waters at other times, and they usually contain much less lime than the normal flows. The reason for this is, obviously, that the water of the flood-flows is mostly composed of rainwater which has come over the surface and without coming into very intimate contact with the soil, and consequently without having taken from it much lime, while the low-water flows contain a considerable proportion of water which has percolated through the soil and thus become charged with lime. It thus becomes an important question whether the flood-flows of a given stream carry enough lime to decompose the sulphate of alumina necessary for their clarification, and it may happen that serious difficulties will be encountered at these times, even with waters which ordinarily present no difficulty in this respect.

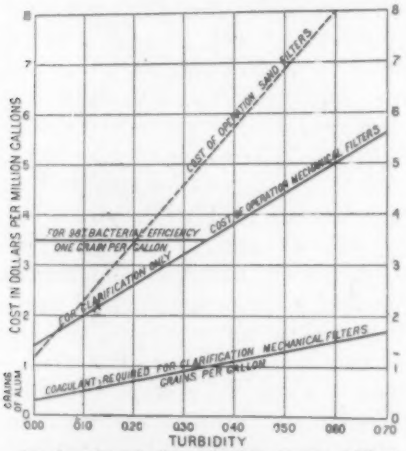
Regarding these two systems of filtration, it can be said that, within certain limits, each is capable of removing mud satisfactorily. In filtration without coagulant the rate of filtration must not be too great, especially with very turbid waters. It is more difficult oftentimes to remove the finest clay particles than to remove the bacteria; and to secure clarification, rates of filtration must be employed lower than would be necessary for bacterial purification.

I recently made some estimates of the cost of clarifying waters of various degrees of turbidity by sand

MARYLAND AVENUE, WASHINGTON, D. C., PAVED WITH ASPHALT BLOCK.

and mechanical filters. These estimates were made for a special set of conditions and I do not know that they will fit others, but they bear at least a suggestive value. The results shown by the diagram include only the cost of operation and not interest and depreciation charges.

With sand filters the frequency of scraping is nearly proportional to the turbidity, and as scraping represents most of the expense, the costs of operation are proportional to the turbidity, except the general


COST IN DOLLARS PER MILLION GALLONS
GRAINS OF ALUM
COST OF OPERATION SAND FILTERS
COST OF OPERATION MECHANICAL FILTERS
FOR 98% BACTERIAL EFFICIENCY ONE GRAIN PER GALLON
FOR CLARIFICATION ONLY
COAGULANT REQUIRED FOR CLARIFICATION MECHANICAL FILTERS GRAINS PER GALLON
TURBIDITY
000 010 020 030 040 050 060 070

Cost of operating sand and mechanical filters with waters of different degrees of humidity. Turbidity of water applied to filter is taken without reference to reduction by preliminary processes. Interest and depreciation charges are not included.

cost and the cost of the amount of scraping which is necessary with even the clearest water.

With mechanical filters the amount of sulphate of alumina required for clarification increases with the turbidity, and most of the cost of operation increases in the same ratio. The diagram shows the amount of sulphate of alumina in grains per gallon necessary for clarification with different degrees of turbidity.

With the clearest waters the costs of operation in the two systems are substantially equal. With muddy waters the expense of operating sand filters increases more rapidly than the expense of operating mechanical filters.

There is another element which often comes into the comparison, namely, the question of purification from the effects of sewage pollution. Nearly all rivers used for public water supplies receive more or less sewage, and in filtering such waters it is regarded as necessary to remove as completely as possible the bacteria.

The quantities of sulphate of alumina required for the clarification of the least turbid waters are not sufficient to give even tolerably good bacterial efficiencies. To secure a reasonably complete removal of bacteria with mechanical filters, the use of a considerable quantity of sulphate of alumina is required. Let us assume that 98 per cent. bacterial efficiency is required, and that to produce this efficiency it is necessary to use one grain of coagulant to the gallon. With water requiring less than this quantity of coagulant for clarification, this quantity must nevertheless be used, and the costs will no longer decrease with decreasing turbidity.

I have added this line to the diagram, and this, combined with the upper portion of the line showing cost of clarification, represents the cost of treating waters with mechanical filters, where both bacterial efficiency and clarification are required.

This line, considered as a whole, increases much less rapidly with increasing turbidity than does the corresponding line for sand filters, and the two lines cross each other. With the clearest waters sand filters are cheaper than mechanical filters, and for the muddiest waters they are more expensive. It does not appear from the diagram, but it is also true in each case, that the

cheaper system is also the more efficient. Sand filters are more efficient in removing bacteria from clear waters than are mechanical filters, and mechanical filters are more efficient in clarifying very muddy waters than are sand filters.

I have been able only to outline some of the problems presented in the clarification of muddy waters. The solution of them, and of the still more difficult problems which arise in the case of larger rivers, will result in freeing American cities from the discomforts of muddy waters.

SOME OF THE MYSTERIES OF PORTLAND CEMENT.

Speaking to a representative of MUNICIPAL ENGINEERING recently regarding articles upon cement which have appeared from time to time in this magazine, Mr. George M. Newcomer, of New York, stated that he always read such articles with a great deal of interest; but he observed a disposition upon the part of nearly all cement experts in the United States to form conclusions which were broader than subsequent events proved were justified. "It frequently happens," said he, "that a test of a given cement will, under almost the same conditions, show widely varying results, and there seems to be no very satisfactory way of explaining it, and I have come to think that what we do not know about cement would fill several interesting volumes. The German method differs from ours, in that with their greater conservatism, they extend their tests over much longer periods and exhibit an amount of patience and thoroughness which few American experts are willing to expend. And when an opinion is finally delivered, it is apt to be qualified.

"A short time ago we received a shipment of cement of a brand classed in the market as highest grade foreign, and known to run unusually regular in set and strength. It had been carefully tested before shipment, and found to be of normal set and strength. On arrival, however, the first lot delivered developed such astonishing speed of set that it was returned to us without ado. Examination of the cargo showed that the entire lot had been mysteriously affected in the same way. If you know of any one who can tell me the cause of it, I wish you would send him around. Presumably the vessel which brought the cement over had previously carried something which impregnated the ship and the cement later, but this is only a guess. We were fortunate in finding a contractor who was looking for a big lot of 'greased lightning' for under-water work, who took the entire lot.

"Not long ago we screened a lot of Portland cement through a hundred-and-eighty-mesh screen. The 26 per cent. which failed to pass was replaced by a like amount of coarse sand. The test of the neat (unmixed) cement and of the sand mixture gave within a few pounds of the same result. Why should this be so if the coarse cement removed has any cementitious quality?"

Mr. Newcomer showed the writer a photograph of the Mechanicsville dam and the report of the expert who made an examination of it. In that work a silica cement was used by mistake, and treated exactly as

MECHANICSVILLE (N. Y.) DAM.

Showing cutting out of natural rock, and integrity of sand cement concrete.

the Portland cement had been in the other parts of the work. The water was turned into the gateways within ten days after placing. Several months later the work was drained and examined to learn the extent of the suspected damage. The examination and the photograph of the work taken at that time show that while the natural rock foundation had been deeply cut out by the action of the water, the concrete of the dam proper remained practically intact.

GRAPHIC TABLE FOR ASCERTAINING CROWN OF ASPHALT AND BRICK PAVEMENTS.

To the Editor Municipal Engineering:

SIR—In the May, 1898, issue of MUNICIPAL ENGINEERING a table and formulæ by Andrew Rosewater are given for the crown of asphalt and brick pavements. While Mr. Rosewater's formulæ are not applicable in all cases, they become of value when used as an indicator of the desired crown as suggested by Mr. Charles Carroll Brown. I have reduced these formulæ to a graphic table, of which I send you a tracing.

The table embraces all widths up to eighty feet. The grade lines read to a 5-per-cent. grade for asphalt and an 8-per-cent. grade for brick, which covers, I think, almost everything met with in ordinary cases, and the value of "C" can be read to hundredths of a foot. To use the table, find the figures (at the bottom of the table for asphalt and at the top of the table for brick) corresponding to the given width of pavement between curbs, and then follow the perpendicular line at that point until it intersects with the line representing the longitudinal grade of the street; when, by following the horizontal line which passes through or near the point of intersection, we read the required crown.

Very respectfully yours,

Elmer L. Andrews,
Asst. City Engineer of Lima, O.

Mr. Andrews' table, as originally drawn in colors, can not be reproduced satisfactorily, but an illustration with all lines in black appears on the opposite page.

THE QUESTION DEPARTMENT.

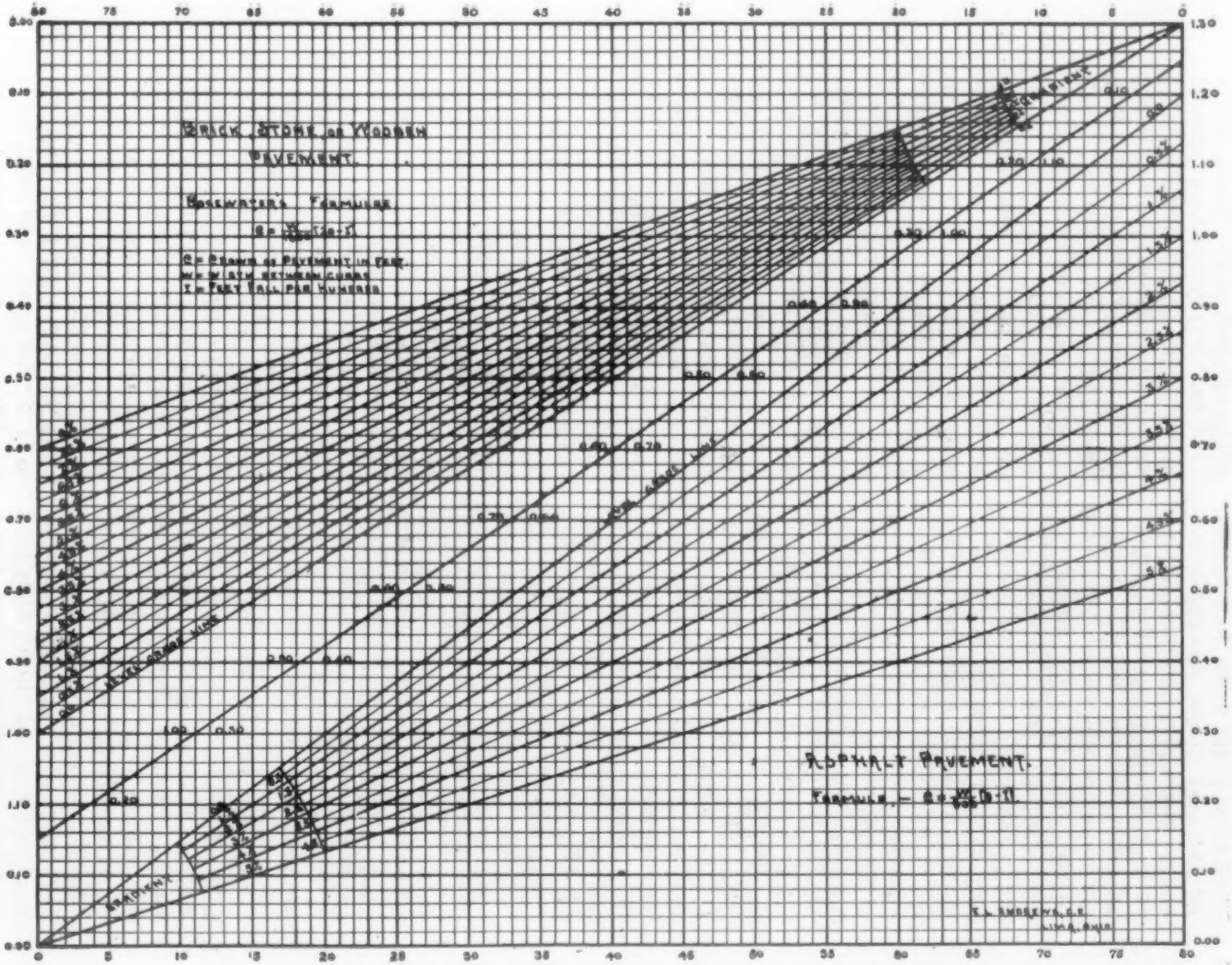
[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

OPENINGS FOR CIVIL ENGINEERS.

Please inform me whether the profession of civil engineering is overcrowded; also are there good openings for all graduates in that business?

J. E. C., Rising Sun, Ind.

These questions can be answered by "yes" or "no," according to the standpoint of the speaker. There is much more work to do than there are engineers to do it, but the public has not yet learned the economy of employing competent civil engineers, and in most instances is satisfied to do its own engineering and to employ a man to do the surveying, drawing and computations, calling him by courtesy an engineer. The young men from our colleges are gradually working into their proper places,



GRAPHIC TABLE FOR ASCERTAINING CROWN OF ASPHALT AND BRICK PAVEMENTS.

at low wages, to be sure. But when a sufficient number of them have succeeded in crowding out those who have been trying to do the work, with little success, there may be an improvement in compensation. These statements apply more particularly to public works, especially in the smaller cities and towns. This is the field in which there is the most need for engineers with thorough theoretical and practical preparation. Municipal work under the direction of city officials, water-works, street railways, etc., will take an increasing number of the young men. Operation and maintenance of railroads, employment with contractors, manufacturing establishments, architectural engineering are also promising fields for men who are fully equipped.

METHODS OF LOCATING LEAKS IN WATER PIPES.

Do you know of any satisfactory "water phone" for testing for leaks in water service pipes or mains?

W. H. Shillinglaw, C. E., Brandon, Man.

The Deacon waste-water detector has been used with success in the city of Boston. It is a detector of leaks and an indicator of possible illegal use of water. Rodda's water-waste detector, and even the rod used for turning off water, are used for the same purpose. They indicate that water is flowing, and if the tests are made when there should be no legitimate use of water, the places which require detailed inspection can be located. An expert with one of these instruments can detect very slight leaks. The only method of determining the amount of leakage is by meters, either permanently placed or on by-passers, from which they can be removed when not in use. By dividing a system of pipes into districts, and using a few meters for each district, leaks or excessive use of water can be detected, and the amount of such waste can be measured. Detailed inspection is necessary here to find the exact location of the waste. The detectors obviate the necessity of inspecting every house, for, on applying one to the outside stop-cock at an hour of the night when there should be no flow of water, it will detect any flow. Only those houses showing such flow need be inspected in detail.

AMOUNT OF STONE USED IN STREET PAVING.

Have you made any investigation of the amount of stone used in paving in cities or towns of the United States, either as Belgian blocks, in concrete and in telford and macadam construction? Would it be possible to obtain such statistics annually from the local road departments, highway commissions, etc.? *R. P. R., N. Y.*

The best recent table on this subject is that made by the Street Paving committee of the American Society of Municipal Improvements for its meeting at Nashville in 1897 and printed in its fourth annual report, and also in this magazine in January, 1898. A. D. Thompson, of Peoria, Ill., was chairman, and D. L. Fulton, of Allegheny, Pa., is secretary of the society. It is possible to get statistics from many cities, but the experience of the committee shows the difficulty of securing statistics from all. Thus from 420 letters sent to officials of cities with 10,000 inhabitants or more, replies were received from 144. Of these 22 had no pavements and 72 had stone pavements. The scope of the inquiry did not include macadam and telford. When smaller cities are included greater difficulties in securing complete tables will be encountered and it will be found impossible to reach all those having pavements in charge with the inquiries if they include hard roads in villages and country districts.

The tabular statements of the results of similar inquiries by the last census bureau show the impossibility of securing complete and uniform statistics. Part of this was due to the incomplete form of the question blank. The society mentioned is trying to aid in increasing the efficiency of the blank for next year and the uniformity of city reports by preparing forms for recommendation to cities and to the census authorities, which shall be the result of the consideration of the subject by the many experts belonging to the society. Copies of the proposed form can be obtained of Chas. C. Brown, at Bloomington, Ill., and will gladly be sent to those willing to offer suggestions. Boards of public works and city engineers can furnish the information for cities, usually in printed reports. The Massachusetts Highway Commission can furnish some data regarding country and village roads in that state. Perhaps some similar information can be obtained from Connecticut, New Jersey and possibly others, but it will be incomplete. Other states can furnish little or nothing, not even reliable information regarding the names and addresses of officials having such work in charge.

EDUCATION REQUIRED FOR PRACTICE OF CIVIL ENGINEERING.

A certain school in Indiana has a course in civil engineering for those that are unable to attend a regular college. It requires 312 days to complete the course. Could a student get enough knowledge of the business in that time to secure employment? *J. E. Craft.*

If the student has a good preparation in elementary mathematics, he may be able to get a fair knowledge of the principles of ordinary surveying, and thus be able to run transit and level and make most of the ordinary computations connected with their use. He may also get a little knowledge of the strength of materials and of the methods of construction of streets, sewers and perhaps of some other engineering works. He can not, however, do more in this time than prepare himself to do the mechanical operations, and can scarcely get even a glimpse of civil engineering as a profession. A liberal education is needed as a basis on which to build a technical training extending over three or four years before one can be fully ready to enter on the practice of the profession. The exceptions to this are few, and they always deplore their lack of adequate training. The writer would not discourage any one from taking the course inquired about if more can not be secured. All study which is worthy the name will develop the man and increase his earning power. But one who expects to become a professional civil engineer, with so short a course and with inadequate preparation, will be greatly disappointed. Employment may be found, but it is likely to be uncertain in duration and poorly paid, and, without additional study, but little advancement can be made beyond a limit fixed by the amount of preparation. Nevertheless the condition of the inquirer may be materially benefited.

COMPARISON OF PRIVATE AND MUNICIPAL ELECTRIC LIGHTING PLANTS.

Will you kindly tell me where I can obtain information as to the results of electric lighting by plants owned by municipalities of say five to ten thousand population? I presume there have been some published reports which would enable one to compare the practical workings of such municipal plants as against those operated by private corporations. Yours truly,
R. S. Sinclair, New York.

Perhaps the most complete disinterested report on electric light-

ing is that made by the electric light committee of the American Society of Municipal Improvements, at the Chicago meeting in 1896, and printed in the third annual report. J. A. Cabot, of Cincinnati, was the chairman of the committee, and D. L. Fulton, Allegheny, Pa., is the secretary of the society. The table gives very full data regarding electric lighting in 171 cities of various sizes, some under public and some under private ownership. The accompanying reports from the members of the committee give the summaries and a few conclusions. The reports seem to be absolutely unbiased, and are more reliable than some published tables on this account. The comparisons desired for the sizes of cities mentioned can be made from the table. Care must be taken in making comparisons, however. There are many variables which modify the cost of the lights, and unless all of them are taken into account injustice may be done. Figures for a single year may be materially better or worse than the average. There are nearly always local conditions which can not be expressed in a tabular statement. Comparisons, therefore, can usually be made only in the most general way.

PRIZES FOR SEWER PLANS.

Some cities have offered prizes for the best plans for sewering their cities. I would like the names of some of the cities that have done so and how they were satisfied with results.

E. E. Ward, Mayor, Brookfield, Mo.

Can any of our readers give us the names of such cities?

See editorial, in department "By Way of Comment," entitled "Architectural and Engineering Competitions," for a discussion of the principles which should underlie such competitions.

NEW FORM OF SEWER INVERT BLOCK.

In your valuable magazine for March, 1899, you have an article written by Arthur N. Talbot, C. E., about "A New Form of Sewer Invert Block." Can you give me the name of a pipe manufacturing company which makes such a block for a 60-inch sewer? Mr. Talbot's article does not mention any, and as I am very much impressed with the block, and as this city is going to build a 60-inch sewer this year, I would deem it a favor if you could give me the desired information, and greatly oblige,

W. Klingberg,
City Engineer, Kingston, N. Y.

Mr. Klingberg's question was referred to Mr. Talbot, who, in answer, writes: "The Monmouth Mining and Manufacturing Company, Monmouth, Ill., has expressed a willingness to make the sewer invert block, described in my paper, and the National Sewer Pipe Company, Akron, Ohio, also states that in case it receives an order it would be willing to manufacture the block. The 60-inch sewer would require a different size and shape of block, and without giving it further thought I can not, of course, say whether they could easily be manufactured."

INFORMATION ABOUT MACADAMIZING.

Have you any books on macadamizing streets with broken stone? The council of this village asked me to write you. I am taking your valuable magazine, and don't know how I could get along without it.

Wm. H. Ambler, Northville, Mich.

The back numbers of MUNICIPAL ENGINEERING are a mine of information on the subject of the construction and maintenance of macadam pavements. In the last volume, for example, there are articles of great value in the numbers for July, September, October and November, 1898. Previous volumes are quite as well supplied with excellent articles. Two articles of special value to our inquirer will be found in June, 1896, and April, 1897, on requirements

for telford macadam and on thin macadam.

Books treating of the subject are listed in our advertising columns, for example, "Road Making and Maintenance," by Herschel and North; Spalding's "Roads and Pavements," Byrne's "Highway Construction," etc.

(B J. W. Howard, B. L. C. E., for MUNICIPAL ENGINEERING.)

KENTUCKY BITUMINOUS SANDSTONE.

I would like to know whether any other deposits of asphalt have been found in Kentucky than those in Breckinbridge county. *Jas. A Munday, Q. C. P. Co., Philadelphia, Pa.*

There are no asphalt deposits in Kentucky. There are quarries and ledges, some above ground, but most underground, that consist of bituminous sandstone or sandstone impregnated with soft bitumen, which ranges from a trace to almost 9 per cent. of the total mineral. This material is found in several counties, principally though in Breckinbridge, Grayson, Hardin, Hart, Edmunson, Warren and Logan, where various openings have been made at intervals during the last twelve years.

NERST ELECTRIC LAMP.

What is the Nerst electric light? *M. A. Simmons, Newark, N. J.*

This lamp is not yet perfected, but its principal parts are established. It is designed to provide a glow lamp for incandescent lighting without a surrounding vacuum.

The following description from the New York *Sun* describes it fairly well:

As used in the present incandescent or glow lamps, the electric current is conducted to a filament of carbon, which, because of its electrical resistance, or choking effect upon the current, is raised to a white heat, and thus emits light. To prevent the destruction of the carbon by burning it is inclosed in glass bulbs, from which the air has been exhausted. Professor Nerst does away with the glass bulb entirely, for in place of the combustible carbon filament he uses filaments of magnesium oxide or other materials which are incombustible. These materials are notable for the large proportion of visible light rays which they radiate. The limelight and the Welsbach gaslight mantles are examples of their value in this regard. These materials are, however, under ordinary circumstances, non-conductors of electricity, and Professor Nerst's discovery, which admits of their use, is that when they are heated they become conductors. Using this discovery in experiments with a hollow magnesium tube, he obtains results which show the expenditure of only .96 watts of electrical energy per candlepower, against about three watts per candle-power for the ordinary glow lamp. This economy in the use of electric energy could be utilized either by putting three times as many lamps on a wire circuit or by reducing the size, and consequently the cost, of the copper conductors for the current. The cost of these is now very great.

So far as has been made public, Professor Nerst has not yet settled upon a commercial form for his lamp. In an experimental form he accomplishes the initial heating of the magnesium filament by placing it in the focus of a reflector, under which is also a spiral coil of platinum wire. A current is first passed through the platinum, which furnishes heat enough at the focus of the reflector to render the magnesium conductive. The current is then switched through the magnesium, and this, becoming incandescent, gives out the light and also gives out heat enough to maintain its own conductivity."

BY WAY OF COMMENT.

Architectual and Engineering Competitions.

A correspondent asks a question which suggests a short discussion of the principles which should underlie competitions of professional men for prizes for designs of works requiring artistic ability or technical skill as distinguished from handy workmanship, such as is needed for draftsmen, surveyors, computers and the like.

In cases where the artistic elements of a design are the most important, such as designs for decorations, statues, monuments, buildings, and architectural structures and adornments in general, such competitions are very popular and are the best means of securing satisfactory designs. In none of these cases are detailed designs and drawings with complete computations required. The location is fixed, the surroundings, present and prospective, are assumed and a sketch is presented in sufficient detail to show the artist's ability to meet the requirements. The greatest reward in the competition is the appointment to prepare the detailed plans and specifications and supervise the construction or to produce the completed painting or statue. The prizes are to compensate for the artistic ability shown and for the comparatively short time spent upon the preliminary sketches furnished. Every one competing does not receive compensation, otherwise incompetents would spend their time preparing sketches for such competitions with no expectation of receiving more than the small prize offered.

In an engineering work, such as a system of sewers, there is one great difference. In the competition of artists there must be an attempt to suit the taste of the people of the community. There is no fixed standard of taste and a really meritorious design nay be rejected because it is not in accord with the crude ideas of the community, and is therefore not suitable for that locality. In the engineering competition there is, however, a fixed standard of technical treatment of the case which is only known to the expert and of which the ordinary citizen is almost wholly incompetent to judge. As is said elsewhere in this number, most American citizens do not recognize the possibility of this, but it is gospel truth, nevertheless.

In an engineering work there is one similarity and one field in which a competition is highly advantageous. All the information, including maps, levels, location of watercourses, lines of development of the city, amount and rates of rainfall, outlets, effects of pollution, character of sub-soil, water levels, etc., should be supplied by the city as the data, just as the corresponding data are supplied to the artist or architect. Sketches showing the general lines of the system, the forms of details to be used, the method of sewage disposal and reports on the treatment of the case

and approximate cost can then be prepared just as the same are prepared by the artist or architect.

The prizes in this case will be for the best design, treatment of details and cost being also considered, and the principal prize will again be the appointment to make detailed designs for use in construction and perhaps the supervision of the same. Each of several of the best designs should receive a prize, and if any novelties in any design submitted are adopted for incorporation in the accepted design, additional compensation should be awarded. For the best results such a competition should be judged by one or more experts without personal bias.

On such a basis as this an engineering competition is not objectionable and may be very advantageous. City officials are apt, however, to look at the expense of the preliminary work of securing the necessary information and try to get rid of this by requiring competitors to gather their own information. This is disastrous for several reasons. Competent engineers know the expense of such work and will not incur it on the chance of securing the first prize, which, if the appointment as designing or consulting engineer is included, is the only one which will warrant it. The competition is therefore restricted to young men trying to get a hold on the profession and incompetents who can find no other chance for employment. If each man must get his own information there is much unnecessary duplication of expensive work which must ultimately be paid for by some one, usually the city.

The conclusion is that engineering competitions may be advantageous if they are placed on the high plane of the best architectural competitions, and all mere drudgery, non-professional work, is completed before the competition is opened, at the direct expense of the city, ready to furnish the data upon which to base the design, if the main prize is the appointment of a designing and perhaps constructing engineer; and if due credit and compensation is given for details drawn from other general designs and incorporated with the successful design, etc. If engineers would formulate rules for the government of such competitions and would refuse to enter them unless such rules were observed, there would be more of them and a material improvement in the status of the profession in this regard would result.

Public Opinion of Experts. In an address before the convention of Health Boards of Ohio, President J. H. Canfield, of Ohio State University, makes the point that the average American accepts himself as an all-round man, able to cope with any problem which arises, from disposing of garbage to managing a campaign against Spain, and that modern conditions are demanding a more thorough and wide-spread recognition of the place and value

of expert knowledge in each class of affairs in which he is interested. This condition of mind arises from the facts of the early life of the country, when experts were few and each man must attempt to do whatever fell to his lot. The relatively good success of nearly all under the simple conditions of the earlier part of the century has developed a confidence in the all-round ability of the American citizen which has not yet been seriously shaken. We all have this feeling, but none of us recognize it in ourselves, even when some one not expert in our own profession attempts to dictate where we know he is absolutely ignorant. Every city official seems to consider himself a born engineer, while the engineers know that their opinion of their abilities is without foundation. But we all know how to run the Spanish war or to negotiate a treaty, even though we have never seen a war ship or interviewed a foreign diplomatist.

We must lose some of our self-confidence and gain in our reverence for practical expert knowledge before we can make much improvement in such matters as city government, including not only construction of public works, but also practical management of city affairs in all their branches. We are slowly beginning to recognize the theoretical advantages of expert service in city departments, but have not yet brought a majority of the voters to this opinion, so that rotation in office and appointments for political reasons will probably continue for some years.

President Canfield thinks that the practical value of expert knowledge depends largely on the faith which the people have in it, which is very true. He also thinks that this faith depends very largely upon the character, the equipment and the integrity of those who are putting forth this expert knowledge to the world. This is true in the sense that if character, equipment or integrity are wanting there will be little faith in the expert. But there is one other important element which has been omitted from the consideration. If we are absolutely ignorant, and are astonished by the show of knowledge in the expert, we may have a sort of blind faith in him, but it is easily shaken by any error he may make or any misunderstanding which may arise. An abiding faith in expert knowledge can only be based on some real knowledge of our own on the subject, which enables us to judge rightly the standing of the expert and the reasons for occasional deficiencies. We are very free in our criticisms in matters of which we know nothing, and are rightly very intolerant of criticisms in our own special province from those without special knowledge. We do not recognize the inconsistency in the two positions.

Cincinnati Filtration Experiments.

The experimental filtration plant in connection with the new Cincinnati waterworks was in operation for ten

months, and the report on the results is now in preparation. The conclusions seem to be that slow sand filtration is sufficient for more than half the time, and that coagulants and about two days' sedimentation before admission to the filter are necessary when the amount of matter in suspension exceeds a definite figure. Mechanical filters obviate all difficulties on account of winter weather, but the two days' sedimentation is recommended for the system also. The slow sand filter is slightly more efficient in removing bacteria, but each removes about 99 per cent. of those in the river water.

On a basis of 80,000,000 gallons capacity, at a net rate of 3,000,000 gallons per acre per day for slow sand filtration and 125,000,000 for mechanical filters, the former will cost for maintenance, operation and capital charges $10.35 and the latter $9.96. In this particular case enlargements of the former would cost more than those of the latter.

Form of Cement Briquettes. A recent paper before the Boston Society of Civil Engineers, by Prof. Jerome Sondericker, gives the results of a number of tests on various forms of briquettes for testing the tensile strength of cement, including a special form similar to one used at the Massachusetts Institute of Technology, one slightly modified from that proposed by Mr. L. C. Sabine in an article in this magazine in February, 1897, one similar at the middle to the standard German form and the form fixed by the American Society of Civil Engineers. On the average the first and fourth of these forms are the strongest, and in some sets the fourth was as much as 8 per cent. stronger than the fourth, while in others it was over 5 per cent. weaker. The second form differed less than 2 per cent. on the average, while the third form was 13 per cent. below the first.

Other tests were made to determine the effect of moving the points at which the grips were applied. They indicated that the strength increased on the average as the distance between the gripping points increased. Assuming the strength when the gripping points were one inch apart as 100 the strength was greater 7 per cent. for 1¼ inches; 8 per cent. for 1½ inches; 12 per cent. for 2 inches; and 18 per cent. for 18 inches. The American Society of Civil Engineers' briquette could be used, of course, only for the first two lengths. The width between grips (across the briquette) increased, of course, as the distance between grips (along the length of the briquette) increased.

These tests seem to indicate the value of the American Society of Civil Engineers' form of briquette, as results with it are quite uniform, are as high as can be obtained with any form used, and, on account of the size of briquette, the distance between grips is quite definitely fixed. This latter point is shown by the tests to be of value,

uniform distance between grips being evidently necessary for securing uniform results.

Methods of Testing Paving Brick.

The article by Mr. Gomer Jones in the March number of Municipal Engineering proposes another method of making the rattler test for paving brick. There are now two prominent methods under discussion with which that of Mr. Jones must be compared. Each has some advantages and the problem is to discover which has the fewest disadvantages, which gives the nearest uniform results. The N. B. M. A. method requires that one kind of brick be tested in the rattler at a time. Mr. Jones agrees in principle with Professor Talbot, who proposes the University of Illinois method when he says that using the same kind of brick does not give the same efficiency for fire clay against fire clay as for shale against shale. Professor Talbot's results show that soft brick are not sufficiently differentiated from harder brick by the N. B. M. A. test. They agree therefore that this detail of the N. B. M. A. rattler test does not give satisfactory results. Professor Talbot seems to prefer to use but one kind of brick in the rattler at one time, but he uses a special form of foundry shot as the abrading material, the weight of which has been chosen after a series of trials. He is now collecting results of tests by his method to show that more satisfactory conclusions can be reached than by the N. B. M. A. method. He makes a step toward securing the same conditions that the brick is under in the street by using iron, as the street is abraded by horseshoes and tires, not by the action of the brick on each other.

Mr. Jones proposes a further approximation to the street conditions by fixing the brick in position, paving the inside of the rattler, and then using iron cubes as the abraiding material. To give an opportunity for the escape of the debris he separates the brick by spaces at sides and ends. The width of these spaces is not given, but from the photograph we would estimate it as nearly an inch. The bricks project about an inch from the staves of the machine in which they are set. It is thus possible to test one or many kinds of brick at the same time. They are subject to blows, rolling and sliding friction as on the street, not exactly the same but of a uniform character. The large spaces between the bricks and the passage of the traffic in only one direction are considerable departures from the conditions in the street. The latter objection could be obviated by reversing the rattler for half the time of the test. Only one of the narrow sides of the brick is worn, leaving the other for comparison in condition and appearance with new brick.

Exact conditions of the street can not be duplicated in the rattler, and our effort must be to secure tests with uniform apparatus in a uniform manner which shall give

concordant results. We will be satisfied with such a test even if it is under conditions quite different in details from those in the street. Whether Mr. Jones' method, where there is uniformity, will give such concordant results is to be determined by many tests of various samples of brick under differing conditions and by different persons.

Professor Talbot's method is very promising. Which is the better must be determined after further experiments. Both these experimenters criticise the N. B. M. A. method adversely, and thus far their points seem to be well taken. We have not heard from the N. B. M. A. side, however.

Ohio Municipal Code Commission. The commission appointed by the governor of Ohio to consider the revision of laws regarding Ohio cities and villages seems to be actuated by a proper public spirit and to be awake to the modern demands of American city life and the drawbacks of American partisan politics in management of city affairs. A recent address by a member of the commission outlines some of the work proposed. The principal contentions are for home rule and a complete and comprehensive merit system of appointments. Legislative intervention is to be prohibited by abolishing the present system of classes of cities, with one city in each class. The form of separation of the legislative and administrative functions of the government so successfully tested in Indianapolis is to be recommended. An improvement of great importance is the establishment of the merit system for nearly all appointees except heads of departments. The composition of the city council is much the same except that a smaller number will probably be provided for.

The commission does not seem to be in favor of municipal ownership of public utilities, excepting sewer systems, on account of the political control of them under present conditions. It seems, however, to hope that the new forms of city government will finally permit what it thinks is really desirable, for it provides for comparatively short terms of franchises and for assumption of municipal control at any time under definite conditions. Payments for franchise privileges are provided for.

A statute to be recommended provides that money illegally spent by city officials can be recovered by suit from the responsible official and his bondsmen.

The commission seems to be fully aware that a good form of government may be abused by bad officers, but is certainly endeavoring to institute the most modern and efficient system. If their labors are acceptable to the legislators of the state, a great source of political corruption in the state will be stopped, and each city can have as good a system of government as its citizens desire, without interference by the legislature, manipulated perhaps by politicians in the minority

in the city but with the majority in the state legislature.

Crowns for Street Pavements.

On another page will be found a diagram by Mr. E. L. Andrews, giving a graphical solution of the formulæ for determining the crowning desirable for paved streets devised by Mr. A. Rosewater, of Omaha, and given in MUNICIPAL ENGINEERING on page 169, March, 1897, and again on page 243, May, 1898. The diagram will give the desired crown at a glance and will be convenient for use in cities where the changes in slope of streets are frequent. It is carried to the usual maxima for asphalt and for block pavements, and in some cities it may be necessary in a few cases to add a line or two for greater slopes. As stated on the pages mentioned these changes in height of crown are desirable particularly for the steeper slopes, and in slippery weather save horses much discomfort and possible danger from the strong tendency to slide toward the gutter.

Observation shows that this is very noticeable, and worth the slight trouble necessary to change the form of cross-section. If forms or templates are used, they must be changed with the change of slope, but this can be done with little expense. For a few feet each side of the point of change the templates can not be used, for the change of cross-section should be made gradually. Stakes can be set or the surface can be laid by eye, with sufficient accuracy.

PERSONAL INFORMATION.

BENZENBERG—After twenty-five years of service in the city engineering department of Milwaukee, George H. Benzenberg will, April 17th, retire from office. Mr. Benzenberg was born in New York, May 31, 1847, and in the following year his parents moved to Milwaukee. In 1855 they moved to Detroit, where Mr. Benzenberg attended school. Later he entered the Michigan University and took a course in the engineering department. While in the university he spent his summer vacations with the United States lake survey in primary triangulation and astronomical work. He graduated from the university in 1867, and joined the lake survey, working for the government for one year. In 1869 he went to Milwaukee, spending a year in the office of Architect E. T. Mix, after which he secured employment with the Chicago, Milwaukee & St. Paul railroad in locating lines that were being built in Iowa. In 1872 he did some difficult locating in the hills in northern Wisconsin for the Chicago & Northern road. He remained with the road until 1873, when he was appointed assistant city engineer. In 1882 he was appointed city engineer and has acted in that capacity ever since, having been reappointed from time to time by both republican and democratic mayors.

During his twenty-five years in the city engineering department Mr. Benzenberg has not only earned a high reputation as a municipal officer, but has been repeatedly called upon by other cities to advise in complicated engineering problems. He has served on three commissions in Chicago, one each in Kansas City, Cleveland, Cincinnati and Erie, and is still serving on the Cincinnati water works commission. He has served as president of the American Society of Municipal Improvements, president of the American Water Works Association, director of the American Society of Civil Engineers and is a member of the New England Water Works Association and similar organizations in other parts of the country.

About the first work that Mr. Benzen-

berg undertook was to complete the Menominee valley intercepting sewerage system, which had just begun when Moses Lane, Mr. Benzenberg's predecessor, died. The canals and the Menominee river were, at that time, so polluted from the refuse of tanneries and slaughtering houses in that part of the city that it was impossible to live near the river. Mr. Benzenberg changed Mr. Lane's plans considerably, and has since constructed a complete system of intercepting sewers, into which the refuse from the slaughter houses and tanneries now empty, instead of into the river. The building of the pumping works on Jones's island, the construction of the flushing tunnel, to which

GEO. H. BENZENBERG, C. E.

strong opposition was shown throughout the city, the removal of the high service pumping system from the Chestnut-st. works and the introduction of a mouel pumping plant at North-ave., the building of the new intake tunnel and the introduction of lift bridges in the city are among Mr. Benzenberg's most important achievemen.. in Milwaukee, although they represent only a few of the problems solved by him during his administration. He has also been successful in protecting the underground mains of the city from electrolysis. Mr. Benzenberg has not decided upon his future plans, but it is safe to predict that a man of his ability and energy will not be long in finding a field for operation.

CASE—The water commissioners of Detroit made the mistake last summer of deposing Capt. L. N. Case from the position of superintendent of the works in that city after many years of successful service. Soon afterward he was called to Duluth, Minn., to take charge of the water works there, where his ability and valuable experience, widely recognized among practical water works people throughout the country, are evidently appreciated, as shown by the reference to him in the annual message on March 7 of Mayor Henry, who said: "The commissioners were exceptionally fortunate in securing the services of a man who has a high reputation as a manager of water and light plants, having spent thirty-five years of his life with the light and water department of the city of Detroit, Mich., ten years of which he was in charge as manager of the plant, and the reputation he enjoys in his former home for honesty and competency is a credit to himself as well as to the city." The mayor's message shows that the net earnings of the water and light plants under the last five months of Capt. Case's management amounted to $66,790.

MEAD—Mr. Daniel W. Mead, whose success in solving the difficult engineering problems connected with the new water supply of Rockford, Ill., described elsewhere in this number of Municipal Engineering, has shown exceptional capability in other undertakings. He is a graduate of the civil engineering department of Cornell university, Ithaca, N. Y. He served with the United States geological survey under Prof. T. C. Chamberlain, U. S. geologist, and was afterward city engineer of Rockford, Ill., for three years. He retired from this position to become the engineer and manager of the Rockford Construction company, and in this capacity was engaged for nine years in the construction of water works, sewers and pavements. He is now located in Chicago as a consulting engineer, devoting himself specially to water works and water supply, hydraulic and other power plants. He has been a valuable member of several techical organizations, including the American Society of Civil Engineers, American Institute of Mechanical Engineers, American Water Works Association, American Public Health Asociation, Western Society Engineers, Franklin Institute and the Illinois Society of Engineers and Surveyors. He was president of the last named organization in 1894 and 1895. He was a member of the commission on paving tests in the National Brick Manufacturers' Association. He has written many valuable contributions on technical subjects, notably on the geology of water supplies, power and power plants, and the manufacture of paving brick.

MORELAND—The president of the Detroit Board of Public Works, D. W. H. Moreland, has often been viciously assailed by the press and people of his city for good service to the public, but they are at last beginning to appreciate him. He evoked a general outburst of praise and gratitude early in March by having Woodward-ave. cleared in a single night of what was described as "an impassable morass of slush

and snow." This was done by organizing an effective force of men and teams, who took up, hauled away and dumped into the river the accumulation of slush, between twilight and dawn of day. Governor Pingree, who assailed Mr. Moreland and attempted to depose him from office about two years ago, is also talking pretty about him now. In an interview in the Detroit Free Press on March 20th, deprecating the use of cedar blocks for paving in Detroit and advocating asphalt instead, the Governor said: "President Moreland of the board of public works is generally known to be an enemy of mine, but, in spite of this, I cannot help recognizing his superior work as a public works commissioner. When a man is doing such good work as Moreland is for the improvement of the city's streets, I am grieved to see some people, who ought to know better, constantly jumping on him and trying to make it appear that he is not a good public works commissioner. Moreland attends to business, keeps abreast of the times and does everything in his power to keep the streets of the city clean and well paved with modern material."

FORTUNE—A loving cup was recently presented to William Fortune, president of Municipal Engineering company, by one hundred of the leading citizens of Indianapolis, including Benjamin Harrison, Rear Admiral Brown (retired), James Whitcomb Riley, H. H. Hanna, S. E. Morss, Mayor Taggart, Senator H. S. New, William E. English and others widely known. The cup is of an especially beautiful design. It is of silver, with gold lining, and has a capacity of four quarts. The three handles are formed in the shape of a grape vine reaching from the top to the base, and a vine of grape leaves encircles the cup at the neck. The presentation was made at Mr. Fortune's residence, with a brief address by the Rev. Gustav A. Carstensen, who, in the course of his remarks, said: "We have come to assure you that your unobtrusive but most potent activity in so many movements for the progress and improvement of our city and state has not escaped our observation. It may have seemed to you at times, when you were putting forth your best efforts, that there were none to praise you and very few to love you for it. We have not come to praise you, for you neither need nor desire our adulation; but we have come to give you the pledge of what we believe you do want—our respect and our affection. We speak for the hundred men whose names are subscribed to this testimonial—a list which might have been easily enlarged, but that we wished to keep the circle small enough for us all to be near to you. With the testimonial we ask your acceptance of this loving cup. Let it be the expression of our kindly thoughts of you and the suggestions of your kindly thoughts of us. Keep it as long as you live, and let it be a legacy to your children, to remind them that their father wore

" 'the white flower of a blameless life
Before a thousand peering littlenesses.' "

The engraved inscription on the cup reads:

To
WILLIAM FORTUNE
from
Citizens of Indianapolis,
In Recognition of His Services in Promoting
the General Welfare of the City.
February, 1899.

Accompanying the cup was the following letter, with the autographs of the hundred citizens who made the presentation: "To William Fortune—We, whose names are subscribed, ask your acceptance of this loving cup as an earnest of our high personal regard. We offer it, also, as a token of our appreciation of your untiring efforts and successful accomplishments in promoting the general and commercial interests of our city and state. Through the Commercial Club and the State Board of Commerce, which you were so largely instrumental in bringing into existence, we have been and shall be able to promote many beneficent reforms and movements for the general welfare, always counting with confidence upon your earnest co-operation. The records of the city's progress bear testimony to the value of your public service, but let this loving cup be a more personal witness to you and to your children of the place you hold in our appreciation. There will always be an ample field for the exercise of your activities in our community and may every success reward your efforts."

Personal Notes.

H. H. Johnson has been appointed city engineer at Portland, Ore.

William M. Carter has been re-elected city surveyor at Woodbury, N. J.

George H. Hart has been elected water commissioner at Maynard, Mass.

William F. Keene has been re-elected city engineer at Central Falls, R. I.

George A. Carpenter has been re-elected city engineer at Pawtucket, R. I.

William Reynolds has been elected water commissioner at Marblehead, Mass.

T. A. S. Hay, C. E., has been appointed city engineer at Peterborough, Ont., Canada.

J. C. Allen has been elected superintendent of the water works and electric light station at Alexandria, La.

Patrick J. Flannery has been appointed water commissioner at Yonkers, N. Y., to succeed Jacob Reid, who died recently.

W. S. Pugh has been elected borough engineer at Pottsville, Pa.

R. E. Neumeyer has been re-elected borough engineer at Bethlehem, Pa.

C. Camerson Corson has been appointed borough engineer at Norristown, Pa.

J. B. Davidson has resigned his position as city engineer at Kenosha, Wis.

John Brazier has been elected superintendent of water works at Alliance, O.

William B. Ferguson has been appointed city engineer at Vancouver, B. C.

Thomas J. Peck has been elected city engineer at Waycross, Ga.

Robert C. Gemmell, M. Am. Soc. C. E., has been re-appointed state engineer of Utah.

Earl Thompson has been appointed borough surveyor at Collingswood, N. J.

C. A. Hoffnagle has been appointed superintendent of the City Water Works at Burlington, Vt.

William Ledyard Cathcart has been appointed adjunct professor of mechanical engineering at Columbia university.

Joseph A. Ashmead, Jamaica, N. Y., has been appointed an assistant engineer in the department of highways, New York City.

John W. Thompson has been re-elected clerk and water works superintendent at Atlantic City, N. J.

Arthur S. C. Wurtele, M. Am. Soc. C. E., who for many years was connected with the public works of the state of New York, died March 20 at Albany, N. Y.

Mr. J. Maxwell Carrere, manager of the cement interests of Charles Warner & Co., New York, has been visiting western cities on business during the last few weeks.

Mr. C. H. Burchinal, manager of the New Castle and Lake Erie Asphalt Block Companies, has been visiting Ohio and Indiana cities during the last two weeks.

A. T. Bell, who has been re-elected city engineer at Memphis, Tenn., has returned from a southern trip, after a seven weeks' illness.

Walter A. McDonald has been elected borough surveyor and Evan Mercer engineer and superintendent of water works at West Chester, Pa.

George E. Batchelder, water registrar of Worcester, Mass., and treasurer of the New England Water Works Association, died March 12, aged sixty-three years.

James L. Tighe, engineer of the water department at Holyoke, Mass., has been appointed city engineer to succeed John J. Kirkpatrick.

G. A. Gessner, jr., has resigned his position as city engineer of Alexandria, Ind., to accept a position in the office of the city engineer of Toledo, O.

Charles H. Black, Chelsea, Mass., president of the Massachusetts Highway Association, has been appointed superintendent of paving for Havana, Cuba.

Louis Coste, chief engineer of the public works department of Canada, is reported as having forwarded his resignation to the minister of public works.

Emil Kuichling, M. Am. Soc. C. E., chief engineer of the water department, Rochester, N. Y., delivered a lecture on riveted steel pipe, March 27, before the students of Rensselaer Polytechnic Institute.

Charles L. Parmelee has resigned his position as assistant engineer to the board of trustees, commissioners of water works, Cincinnati, O., to accept that of chief engineer of the Continental Filter company, New York City.

J. A. Dennison has been appointed chairman and Christopher W. Harden treasurer of the township committee, and Eugene W. Chamberlain, overseer of sewers and roads, at Westfield, N. J.

B. C. Bement, president of the board of water commissioners, St. Paul, Minn., has been appointed acting general manager of the Superior Water, Light and Power company, Superior, Wis.

Albert H. Porter, Niagara Falls, N. Y., has been appointed assistant superintendent of public works for the western division of canals in New York, to succeed Col. R. G. Lay.

C. A. Alderman has resigned his position as city engineer at Eau Claire, Wis., and will assume charge of the construction of the Dayton, Springfield & Urbana electric railway, with headquarters, for the present, at Springfield, O.

H. M. Lofton, Savannah, Ga., has resigned his position as superintendent of water works to become general manager of the street railway system. He will be succeeded by J. U. Kinsey, who has been connected with the water works for sixteen years.

Edward B. Guthrie, M. Am. Soc. C. E., and George C. Diehl have formed a partnership, with offices at Ellicott Square, Buffalo, N. Y.

H. S. Wilson has been elected borough engineer and B. H. Willauer superintendent of water works at Phoenixville, Pa.

William Jones has been elected president of the water works trustees at Toledo, O., to fill the unexpired term of L. K. Parks, resigned. Lem P. Harris, the new member of the board, took his seat and qualified as a member March 2d.

J. M. Wolverton, M. Am. Soc. C. E., has resigned his position as chief engineer of the New Columbus Bridge company, Columbus, O., to accept that of chief engineer of the Mount Vernon Bridge works. He will have charge of the office and shops at Mount Vernon, O.

Daniel W. Mead, M. Am. Soc. C. E., has established an office at 605 First National Bank Building, Chicago, and will make a specialty of designing and improving water and sewerage works, electric and power plants, hydraulic works and the transmission of power.

Stephen E. Babcock has resigned his position as city engineer of Little Falls, N. Y., and will be succeeded by John McComb, lately connected with the Deep Water Ways Surveys. Mr. Babcock is at present chief engineer of extensions and improvements to the water works of Amsterdam, N. Y., and also chief engineer of the Herkimer & Utica Electric railroad.

An advisory board to the state engineer and the superintendent of public works has been appointed by Governor Roosevelt of New York, as follows: Maj. T. W. Symons, M. Am. Soc. C. E.; Gen. Francis V. Greene, M. Am. Soc. C. E., president of the Barber Asphalt Paving company; John T. Schatcherd, Buffalo; G. E. Green, Binghamton; Frank S. Wetherbee, New York City. The duty of the board is to investigate the advisability of completing the improvements of the state canals, of turning them over to the national government and to ascertain the extent to which railways have taken the place of canals.

CURRENT INFORMATION.

Scientific Road Construction in Massachusetts.

The Massachusetts Highway Commission has issued its report for 1898. It recommends a change in the present law, which requires the commission to allow the town or city officials thirty days to consider whether they will accept the contract and prices fixed by the commission. A change reducing this time from thirty to ten days is suggested. On a large number of contracts this would make twenty days available in the best part of the season. The conclusions of William E. McClintock, one of the commissioners, are given in the report, regarding a personal investigation of the state roads built in New Jersey under the supervision of Henry J. Budd, state commissioner. He found that most of these roads traverse a fairly level country, which reduced the cost of grading to a low figure compared with the expense necessary in Massachusetts. A large part of the little grading which is necessary was also done in material removed cheaply and hauled short distances. Most of the roads had a nominal depth of stone of 8 ins., and it was stated that 9 ins. of broken stone rolled to 8 ins. On this basis, and estimating a cubic yard to weigh 1 1-3 tons, a mile of road 15 feet wide requires about 2,933 tons of broken stone, and at a cost of $1.60 per ton the expense for stone would be $4,693. In New Jersey the stone is spread to a depth of 9 ins., which is assumed to give a depth of 8 ins. after rolling. In Massachusetts the stone is laid to arbitrary grades and an absolute depth of 6 ins. is maintained. This difference between the thickness in the two states may be attributed to the different methods of working. In New Jersey the contracts are let at a stipulated price per square yard, and in Massachusetts all the broken stone is weighed and the contractor is paid for each ton placed upon the road. It is pointed out that under the New Jersey method it is a simple matter to estimate the amount of stone required on any road, while in the Massachusetts system of maintaining the top surface of the stone at an arbitrary grade results in much loss when the stone is pressed down into the subgrade. This results in considerably increasing the average number of tons of stone per mile of 15-foot roads. In Masachusetts the prices paid on labor are 20 per cent. higher than in New Jersey and one-third higher on teams, and 11 per cent. higher on the length of the working day. A mile of 15-foot roadway in New Jersey costs about $4,700, and a similar road in Massachusetts costs about $5,700. In New Jersey all bridges, culverts and fences are built by the county, while in Massachusetts this expense is figured in with the cost of the state roads. New Jersey's practice of building roads only 10 to 12 feet wide is favorably spoken of by the Massachusetts commission.

Charles Mills, chief engineer of the commission, reports his experience in maintaining some of the state roads. He says that formerly where horse tracks formed on a road it was necessary to fill them with broken stone, cover it with screenings and then roll the place, with the result that the horses would continue to travel in the old track, kick out the stone in dry weather and make more repairs necessary. It has been found that if the horse track is filled with broken stone without screenings the horses avoid it and travel on the side, so that the wheels gradually compact the stone. It is not so easily kicked out as when compacted by the roller, and the horse track does not reappear. When screenings have been blown or washed off the roads and a binder is needed to prevent the stone from unraveling, screenings, blue gravel, clayey sand and coarse, sharp sand have all been used in order to determine the relative value of the different materials. So far the best results have been obtained by using coarse sharp sand.

Several sections of road have been surfaced with selected gravel. Where they are continuations of roads surfaced with broken stone, so that they are subjected to travel of the same amount and character as the broken-stone sections, the relative wearing properties of the types are easily ascertained. It is seen that the gravel surface does not stand the travel so well as the macadam; although very good in dry weather it becomes rutted in wet periods and the expense of maintenance is very much larger than for a stone road. In building roads where the soil is clayey and good sandy gravel can be obtained, the latter has been used in place of telford with good results. In one place where gravel would have to be hauled for some distance, while a poor quality of stone was abundant and would cost no more than the gravel, 6 inches of broken stone as it came from the crusher was used for a foundation. Whether this mode of construction was advisable can only be determined by further use of the road.

A system of continuous repairs was inaugurated in 1898, for the maintenance of the roads as follows: One man with a horse is employed to look after as long a

piece of road as can be properly cared for. This care included picking off loose stone, filling any incipient ruts or hollows, spreading binding material when the old material had been displaced, cutting the weeds alongside the roadway, filling any small washouts on the shoulders, and in general keeping the whole road in good repair. Broken stone of two sizes, half-inch screenings and that which passes a 2½-inch mesh and stops on a ½-inch mesh, has been stacked in small piles at convenient distances along the side of the road in the same manner followed with much success for many years in Europe. It is hoped that this system will give good results at a minimum cost.

Prof. Logan Waller Page, geologist of the commission, described the apparatus recently constructed for making abrasion and cementation tests, which have thus far proved the most useful methods of determining the utility of different road metals. The abrasion test is almost identical with the Deval test used by the National School of Roads and Bridges of France, the difference between the two being the omission of certain processes, not strictly necessary, for the purpose of saving time. A new machine was constructed during the year. It consists of four cylinders, each 7.9 inches in diameter and 13.4 inches deep, fastened to a shaft so that the axis of each makes an angle of 30 degrees with the axis of rotation. Each cylinder is closed at one end and has a tightly-fitting cover at the other. At one end of the shaft is a pulley by which the cylinders are revolved, and at the other end is a revolution counter. Four tests can be carried on at the same time with this machine.

The stones used are between 1¼ and 2½ inches in diameter, about the size used in making macadam roads. In a test 11 pounds of perfectly clean stone are placed in a cylinder, the cover is bolted on and the cylinder is rotated at the rate of 2,000 revolutions per hour for five hours. At each revolution of the shaft the fragments of stone are thrown twice from one end of the cylinder to the other, grinding them against each other and against the walls. At the end of the test the contents of the cylinder are placed on a sieve having 1-16-inch meshes. The material passing the sieve is put aside for the comentation test. The sieve and the stone remaining on it are held under running water until all the adhering dust is washed off. The stone is then thoroughly dried and carefully weighed, the decrease giving the weight of the detritus worn off by the test. The percentage of the detritus may be taken as a coefficient of wear, or the coefficient adopted by the National School of Roads and Bridges of France may be used. The latter has been adopted by the commission, and is expressed by the formula, coefficient of wear equals 400 divided by w, where w is the weight in grams of detritus under 1-16 inch, obtained per kilogram of stone used.

The purpose of the cementation test is to obtain the relative binding power of the various stones used in road making. Experiments have been carried on for the past five years in the laboratory of the commission to determine some way of testing this important property. The test finally adopted is made by subjecting stonedust briquettes to impact in a special apparatus. The briquettes are made of dust, which has passed through a screen with 100 meshes per inch. The dust is obtained either from the detritus of the abrasion test or by specially reducing the stone. The briquettes are of circular section 0.98 inch in diameter and of the same hight, made by placing the dust in a metal die and mixing with it enough distilled water (about 0.24 cubic inch) to moisten it. A closely fitting plug is then inserted on top of the wet dust and subjected to a pressure of 1,422 pounds per square inch. The weight of dust varies with the density and compressibility of the stone, but generally about 0.9 ounce is required to make a briquette of the above dimensions. Two weeks should be allowed for the briquette to dry at the ordinary temperature of a room.

The machine used for testing these briquettes consists of a hammer, weighing 2.2 pounds, arranged like the hammer of a pile driver on two vertical guides. It is raised by a screw and dropped automatically from any desired hight, falling on a plunger which rests on the briquette. The plunger is bolted to a cross-head which is guided by two vertical rods. A small lever, carrying a pencil at its free end is connected to the side of the cross-head by a link motion, arranged so that it gives a vertical movement to the pencil six times as great as the movement of the cross-head. The pencil is pressed against a drum and its movement is recorded on a slip of paper fastened on this drum, which is moved automatically through a small angle at each stroke of the hammer, and in this way a record is obtained of the movement of the hammer after each blow. The standard fall of the hammer for a test is 0.39 inch, and the blow is repeated until the bond of cementation of the material is destroyed. The final blow is easily ascertained, for when the hammer

falls on the plunger, if the material beneath it can withstand the blow, the plunger rebounds; if not, the plunger stays at the point to which it is driven. The number of blows needed to break the bond is taken as representing the binding power of each stone, and is so used in comparing this property in road materials.

An automatic screen is used in preparing the stone dust for the cementation test. It is about 39.37 inches long by 4 inches in diameter, and consists of a cylinder of brass wire netting of five different meshes; 100 meshes per inch at one end and decreasing by 20 meshes each time to 20 meshes per inch at the other end, the smallest size being at the end where the dust enters. The cylinder is mounted on bearings at a slight angle to the horizontal. The unscreened dust is automatically fed into the upper end from a hopper, while the cylinder is rotating and in its passage is sifted into the various sizes. The upper end of the cylinder rests on wheel bearings, and on the bearing surfaces are several ridges which lift the cylinder as they pass over the wheels. This shaking device is necessary to prevent clogging of the finer meshes of the screen. This screen works very rapidly, and as it is entirely covered, no dust can escape into the air.

Havana Pavements, Sewers and Alleged Contracts.

Many rumors and statements have been circulated and even published by reliable journals concerning paving contracts or concessions for pavements and sewers, variously estimated from $1,200,000 to $14,000,000, to be laid in the city of Havana. No such concessions or contracts exist beyond the attempt of one or more contractors to secure, under the guise of contracts, exclusive permission and concessions in that city, which are forbidden by sec. 2 of the act of Congress, reading, "No franchises or concessions of any kind shall be granted by the United States or other authority in Cuba during the occupation by the United States."

The city of Havana has most of its business streets now paved with large square granite blocks, some of them badly rounded from wear. The principal avenues and a few other streets are macadamized with the only available stone, which is a soft limestone requiring constant renewals. There are two or three squares paved with wooden block pavement on concrete foundation, with the blocks carefully formed and set tight together, and suiting the light traffic fairly well. The newer portions of the city and suburbs, however, have very few pavements. About ten years ago a Mr. Taylor secured a concession from the Spanish authorities under which he relaid many of the sidewalks of the city and paved certain streets, generally with stone blocks from United States, for which he was duly paid, but with little or no profit eventually resulting to him. At his death, a short time ago, there remained a few unfinished streets included in his concession. The empty municipal treasury previous to the insurrection had much to do with the non-completion of his work. Since his death an attempt has been made by Mr. Hawley, acting independently and without connection with any paving company, to claim the right, by assignment or otherwise, on the part of the heirs of Mr. Taylor, to continue the work under the original concession to Taylor, notwithstanding the complete downfall of previous administrations and the new regime in Havana, all of which turns upon local laws and ordinances, details of which would not interest our readers.

Another attempt, begun in 1894, to secure contracts or concessions for pavements and sewers in Havana was entered upon by an American contractor, Mr. Dady, who, by a deposit of five hundred dollars as security, secured the right to make, at his expense, surveys and submit, for acceptance, plans for sewers and additional pavements for Havana, the conditions being that if he should get his plans adopted and not secure the contract, he would be paid an amount sufficient to cover the cost of his surveys and plans to be determined by arbitrators. Previously existing excellent contour maps supplemented by the work of Mr. Dady's engineer, enabled him to lay before the city certain plans understood to have cost him previous to the war with Spain possibly fifteen thousand dollars, including many incidental but necessary local expenses.

The city of Havana has no engineering force to devise its own plans as is customary in American cities, therefore the above system of getting plans. The proposed method of raising funds to pay for the improvements was a separate matter not a part of the Dady plans. It consisted principally in issuing new bonds, part to refund old street city debts and a part to raise additional money to pay for sewers and pavements. This has not been done. The war with the United States broke off Spanish authority or suspended it with the signing of the protocol. Immediately thereafter during the protocol Mr. Dady secured

legislation from the departing Cuban government which, in words, seemed to give him the sole right to construct the sewers and to lay pavements according to his plans. This was not fully approved by Spain. The advent of United States authority and army engineers have brought the whole matter in review, including an examination of his plans with the result that his concession does not seem to legally bind the city, nor does it seem to be the policy of the United States to encourage wholesale construction of public works in the immediate future, nor does the administration at Washington desire to almost double the debt of Havana. The policy seems to be to consider the purchase of the Dady plans for what they may be worth and improve Havana as circumstances may demand and means can be provided, using such portions of existing plans and improvements thereon as the able engineers now in charge of the city may adopt.

PARK AVENUE, WARREN, OHIO, PAVED WITH ASPHALT BLOCK.

Asphalt Blocks for Street Paving.

Some information regarding compressed asphalt blocks for paving purposes is given in an attractively illustrated pamphlet recently issued by the Lake Erie Asphalt Block company, in which it is stated that the first blocks of this kind were made in San Francisco in 1869. The appliances at that time were crude and the work was done under great difficulties. The processes have since been gradually developed at great expense, and there are now several companies engaged in the business of making and laying this form of paving block, for which special advantages are claimed. The blocks are made of crushed stone and Trinidad asphalt. The machinery and appliances required for these different processes of crushing and pulverizing and heating the stone, melting and mixing the asphalt, mixing and combining the heated materials and pressing them into block form, are heavy and expensive, the press alone weighing 25,000 pounds and several of the other machines from 14,000 to 18,000 pounds each. The stone, as it comes from the quarry, is first crushed, then rolled and screened till partly pulverized, then heated to a high degree of temperature, mixed with a certain portion of asphaltic paving cement, and finally subjected in this heated state to an immense pressure and moulded into a solid, homogeneous block; it is then cooled under water and is ready for immediate use. The pulverized stone combining with the refined liquid asphalt forms a cement with which all of the larger particles of stone are coated. Trap rock and limestone have heretofore been used. An innovation is about to be introduced, however, in the new plant at Toledo by substituting copper sands for these materials. Some months ago Mr. C.

H. Burchinal, manager of the New Castle Asphalt Block company, in making a trip through the lake region with an eye to business, became interested in this refuse material of copper milling as something that could be advantageously utilized in his processes, being attracted to it by its extreme hardness and fineness. His experiments were satisfactory and he determined upon its use. In a recent grinding test of five and a half hours he found that a block in which limestone was used lost 1½ inches, a trap rock block lost ⅝ of an inch, and only ⅛ of an inch was worn from a conglomerate block in which the copper sand was used. The new material also makes a difference in the color. The crushed stone blocks have a light grey appearance, while the copper sands give to the block a terra cotta color. The supply of copper sand, Mr. Burchinal says, is inexhaustible, as there is about 2,500 tons per day dumped into Portage bay by the copper stamping mills located there.

The asphalt blocks are made under patents owned by the International Block company and the Maryland Asphalt Block, of which Mr. W. S. Wilkinson is president, but several companies are licensed to manufacture them, including the New Castle Asphalt Block company, the Lake Erie Asphalt Block company, the Hastings Pavement company and the Washington Tile & Block company. Mr. Wilkinson has been a pioneer in the business and introduced the pavement in this country and in Mexico City, where much of it has been laid. The material is most extensively in use in the United States, in Baltimore and Washington, but it has also been laid, as shown by recent data, in Philadelphia, Erie, Norristown, Media, Allentown, Reading, Sheridan, York, Chester, Pottsville, Huntington, Harrisburg, Lebanon, New Castle and Meadville, Pa.; New York City; Michigan City, Richmond and Ft. Wayne, Ind.; Burlington, Riverton, Trenton, Cape May, Atlantic City and Camden, N. J.; Niles, Alliance, Youngstown, Salem, Warren, Cleveland, Sandusky, Dayton, Akron and Hamilton, O.; Dobb's Ferry, Sing Sing, Middletown, Schenectady, Hudson, Poughkeepsie and Brooklyn, N. Y.; New Bedford and Holyoke, Mass.; New Haven, Hartford, Waterbury and Stamford, Conn.; Wilmington, Del.; Richmond, Va. It has been longest in use in Baltimore, Washington, Philadelphia and New York. In addition to its use for paving streets, it is in demand for bridge and sidewalk paving.

MAHONING AVENUE, YOUNGSTOWN, OHIO, PAVED WITH ASPHALT BLOCK.

Decision in a Case Where Improvements Cost More Than the Value of Property.

The United States supreme court recently rendered a decision in the case of C. P. Dewey vs. the city of Des Moines in favor of the plaintiff. Dewey lived in Illinois, but owned property along E. Grand-ave., Des Moines, near the fair grounds. The street was repaired and the cost prorated among

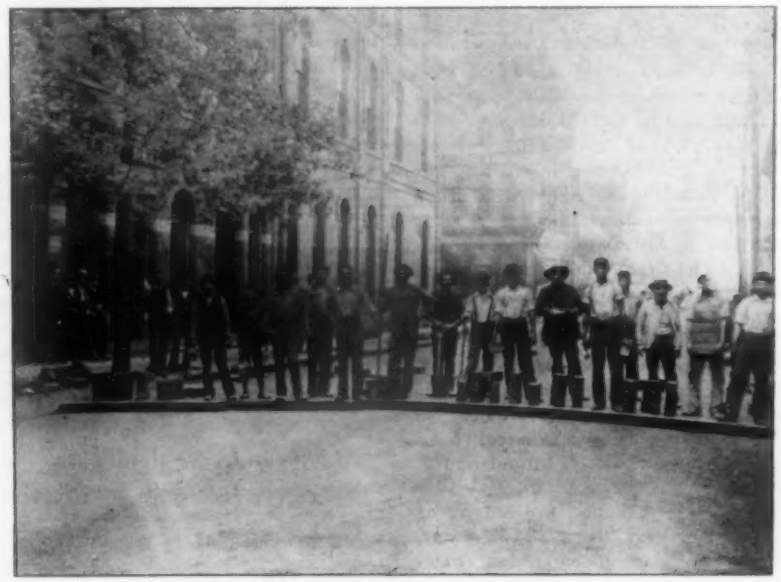
the adjoining property-owners, but Dewey failed to take up the certificates. The taxes were not paid and the property was sold at a tax sale, but a deficiency of about $13,000 still remained. Judgment was entered against him in the circuit court of appeals for his unpaid portion of assessment, and when the city sought to transfer the judgment to Illinois to levy on the property of Dewey he objected, claiming that the assessment was unconstitutional, as it sought to confiscate his property for public use without compensation. Justice Peckham wrote the opinion, the ruling of which is exactly the same as that of the United States supreme court in the paving case of Norwood vs. Baker, which was given in the March number of Municipal Engineering.

Paving Brick in England.

Brick paving for carriage ways was the subject reported upon by J. T. Eayrs at the last annual meeting of the Incorporated Association of Municipal and County Engineers in Lincoln. Mr. Eayrs has made some tests for a firm who had secured suitable clays for the manufacture of bricks with a special view to street paving. A diagram was also prepared by Mr. Eayrs, showing graphically the results of tests and for the purpose of comparison he has indicated therein the results of tests of the best American paving bricks. The abrasion and impact tests of the American bricks is taken from those manufactured by representative firms and the absorption test is the average of thirty-five picked bricks, including the best paving bricks produced in this country.

The Glass Pavement at Lyons.

The report of John C. Covert, United States consul at Lyons, says that a paving contractor in that city began laying a pavement last October of ceramocrystal, or devitrified glass, laid in the form of blocks 8 ins. square and each block containing sixteen parts in the form of checkers, fitted together so that water cannot pass between them. The advantages claimed are that it offers a greater resistance than stone; that it is a poor conductor of cold and ice will not readily form upon it; that dirt will not accumulate upon it as easily as upon stone, and it will not retain microbes; that it is more durable than stone and just as cheap. The material is obtained from broken glass, which is heated to a temperature of 1,250 degrees and compressed in matrices by hydraulic force.



LAYING ASPHALT BLOCK PAVEMENT ON MERCER STREET, NEW CASTLE, PA.

Urgent Need of Legislation Relating to Public Improvements in Iowa.

The tax-payers of Dubuque, Ia., recently began agitation for a special session of the legislature to revise the special assessment laws. They claim that unless remedial legislation is promptly secured public improve-

ment will be practically stopped, and, moreover, that many cities will have to pay bonds issued under the present defective law, although receiving no financial benefit therefrom. Dubuque's outstanding special assessments aggregate over $250,000. These assessments have now been invalidated and the law must be amended so as to enable the city to levy new assessments based nominally on benefits, but really on frontage, except where the abutter can establish that the frontage basis would be unjust to him. The city attorney is of the opinion that unless an extra session is called the city will be overwhelmed with injunction suits, and that no municipal improvements can be made this year at the cost of the abutters.

Organization of Indiana Contractors.

A meeting of Indiana contractors for road construction, street paving and other public work was held in Indianapolis on March 28-29 for the purpose of forming an organization to protect their interests. The initiative steps in the movement were taken by contractors in southern Indiana. A large number were in attendance and an organization was formed under the name of the Indiana Turnpike and Street Contractors' Association. Officers were elected as follows: President, Ewing Shields, Bedford, Ind.; vice-president, M. L. Bolin, Tipton; treasurer, D. H. Fatout, Indianapolis, and secretary, J. F. O'Brien, Cloverdale. An executive committee was appointed, composed of M. L. Bolin, D. H. Fatout and J. F. O'Brien.

In a statement explaining the objects of the organization, Mr. O'Brien, the secretary, said that the interested contractors, numbering about sixty and scattered throughout the state, have on hand contracts for public work costing about $2,000,000, consisting largely of road and bridge construction, street paving and sewer building. These contracts are largely for unfinished work undertaken last year. They find that they are now confronted with serious difficulties caused by demands for increased prices for material and in addition they are threatened with some embarrassment by a law passed at the recent session of the Indiana legislature stipulating that contractors for public work shall pay laborers at the rate of not less than 15 cents per hour, while these unfinished contracts were based on estimates of the prevailing wage scale of 10 and 12½ cents per hour last year. The law is regarded as unconstitutional, but it is apt, nevertheless, to cause the contractors much trouble. The contractors regard themselves as the victims of the industrial combinations which are now tending to higher prices and they hope by organization to protect themselves in some measure from the heavy losses which they are apprehensive they will suffer on their unfinished contracts if they are not afforded relief. The statement is made that they will undertake to raise $300,000 of capital for the manufacture of sewer pipe, paving brick and bridge materials for their own use. After discussing the matter in secret session they decided to hold another meeting in Indianapolis on April 26th and appointed a committee on organization to take further steps in the meantime toward uniting the contractors. This committee is composed of D. H. Fatout of Indianapolis; D. Stillinger, Columbus; J. F. Lawson, Levi; J. W. Gore, Forest; Cal Miller, Marion; P. Fitzpatrick, Brazil; Ewing Shields, Bedford; D. C. De Harity, Elwood; E. F. Cox, Worthington; William Shields, Rockford; Riley Phillips, Redkey, and M. J. Carroll, Crawfordsville.

Value of Paving Brick and Sewer Pipe

Statistics gathered by the United States Geological Bureau show that the production of paving brick increased from 320,407,000 in 1896, worth $2,794,585 or $8.72 per thousand, to 435,851,000 in 1897, valued at $3,582,037, or $8.22 per thousand. The vitrified brick product shows the greatest increase in the clay industry. The sewer pipe product decreased from $4,588,503 in 1896 to $4,069,534 in 1897.

Instruction for Health Officers.

Ohio State University will begin this month an interesting experiment. It offers valuable courses of lectures on subjects directly connected with the work of the health officer, but equally valuable for other city officials and persons interested in the physical welfare of the city. The courses extend over six weeks with fourteen lectures each week by six of the professors in the college. They include short courses in chemical examination of air and water supplies, water supply for domestic uses, sewers and sewage disposal, garbage removal and disposal, inspection of plumbing, bacteriology, disinfectants, anti-septics, milk and meat inspection, sanitary legislation and the detailed duties of the health officer in inspections, collection of statistics and in cases of contagious disease. City engineers would do well to take the same course and councilmen and police officials would find many difficulties solved if they knew even the little that can be gained in six weeks. Health officers will doubtless gain more as their previous training has formed a good basis

for the work. It is hoped that the experiment will be successful and that it will be tried by other state institutions also.

New Highway Bills in Illinois.

The Illinois senate passed two bills recently relative to highways: 1. No bridge shall be built which will not sustain a load of 100 pounds to the square foot. 2. The engineer of a traction engine, when traveling on the highway, must blow his whistle forty rods from all crossings and upon approaching all hill tops.

Views of Detroit Physicians on Pavements.

The Detroit board of public works recently requested an opinion from the physicians of that city regarding asphalt as a sanitary pavement. The replies of the physicians, up to March 16, were almost unanimously in favor of asphalt and brick and are strongly against cedar blocks.

Constitutionality of Ohio Improvement Laws Sustained.

The Supreme Court of Ohio, in an opinion handed down March 7, affirmed the judgment of the lower court in the case of Margaret H. Hutchinson vs. the city of Columbus. The plaintiff attacked the constitutionality of the Taylor law and the method of passing ordinances and resolutions in the city council, claiming that the improvement of First avenue was made against her protest. The decision is against the plaintiff.

Receiver Asked for an Asphalt Company.

A telegram states that the Newark stockholders of Newark Asphalt Paving and Construction company on March 27 applied for a receiver on allegations of insolvency, and that prices bid by Mr. MacDonald, the manager, for street paving contracts were less than the cost of work.

The Cincinnati Water Works Contract

The ruling of Judge Samuel W. Smith in the suit against the water works commissioners of Cincinnati, to enjoin further proceedings under the Lane & Bodley contracts for engines, cranes, etc., for the new water works plant, has been affirmed by Judge Swing of the circuit court. The decision upholds the trustees. The failure of the commissioners to adopt full plans and specifications for the engines before entering upon the contract and the fact that the additional engine and electrical crane were not named in the advertisement calling for the sealed proposals are the main points upon which the plaintiff claimed the contract was invalid.

The court referred to the difficulty confronting the trustees in arriving at a correct construction of the statute, as to what extent "detailed drawings and specifications" were to go, as to how minute the "details" must be. Considering this feature, the court on the subject of the reasonable scope of authority in the trustees, held that the sixteen pages of printed specifications were as detailed and comprehensive as could well be. What the trustees wanted to get for the city were engines and pumps that would pump a given quantity of water in a given time. It was wholly immaterial to them where each nut, bolt or valve was to be in the "detail" of the work of building such machinery. It must pump 30,000,000 gallons per day on a test of six days' running, or 180,000,000, and must stand such test for a year at the expense of the builders for alterations and repairs. What they did was to get the essentials and to leave out the nonessentials, and in doing this the appellate court thought they did their full duty, and did it with honor and credit.

The only claim that can be justly made is that the letter of the law has not been followed, and the answer is that it should not be followed, and that the real purpose of the law would be defeated by adhering to it. The court thought the alleged delegation by the trustees of their power to the chief engineer was not such in the sense of taking away the power vested in the trustees. He was their agent, and merely using his technical knowledge in their behalf and entirely subject to their control. No objection was found with the alternative bidding nor to the provisions of the contract for alteration and modification. It is a provision for the protection of the city, and properly so where improvements are constant and rapid, and especially so in an era of such progress in invention that, within a period of twenty-five years, as testified by the chief engineer, such changes had been made that machinery of this character does three times the work it formerly did.

A City Restrained from Polluting a Stream.

By a decision of the chancery court of New Jersey, Paterson must not increase the quantity of the sewage it empties into the Passaic river. The suit was brought about a year ago by the riparian owners between the Great Falls of the Passaic river, at Paterson, and the Dundee dam at Passaic, with whom was joined Jersey City, as

having certain rights to take water from the river for a public water supply. The plaintiffs asked that Paterson be enjoined from discharging sewage into the river from existing or future sewer outlets, but the effect of the decision only prohibits any increase in the present volume of sewage, leaving the complete stoppage of the use of the river as a place of sewage deposit until the final hearing of the case. In his opinion the chancellor says that the complainants own to the middle of the river from the banks, and they are entitled to have the water flow to them unpolluted that they may use it for domestic and business purposes. As grantee of the state, of the right to take "pure and wholesome water" from the river at the location of its pumping plant for the uses of its inhabitants, Jersey City suffers special injury from the pollution of the stream. The injury lies not alone in the depreciation of the value of the plant erected for the purpose of utilizing the right given by the statute, but also in the deprivation of the inhabitants of Jersey City of the use of the waters of the Passaic river, for whose benefit the grant was made. Thus, the pollution of the Passaic river affects injuriously all the relators and complainants in depriving them of their respective lawful uses of the water. All suffer a common injury—the loss of the same pure and wholesome water and the substitution for it of a polluted and offensive water, from a single cause—the pollution from the Paterson sewers. The same is true as to the baneful effect of the noxious odors that arise from the polluted waters. In reply to the contention that Paterson had the right to empty its sewers into the Passaic river, partly upon the ground that it is a natural and reasonable use of the river and partly because the legislature gives the city authority to construct sewers, the chancellor says:

"The authority conferred is limited to mere construction of the sewers in accordance with the maps. It does not license either public or private nuisance through pollution of the waters of the river."

As to private rights it is well settled that the legislative authority to merely drain into a stream does not authorize the contamination of the water. Legislative license to create a public nuisance of the kind considered must be given in express terms or by absolutely necessary implication.

The decision of the chancellor will be appealed to the Court of Errors. Under the decision suits may be brought against other municipalities along the Passaic by riparian owners.

A City Sues for Damages from Electrolysis.

The city of Dayton, O., has instituted suit for $45,000 damages against the City Railway company, alleging injury to water pipes from electrolysis. The city claims that through the carelessness of the company in the management of the electric motive power fully 75 per cent. of the current used in propelling the cars follows the water pipes, thus causing them to break at many points.

How Frozen Earth Is Thawed for Pipe Laying.

By means of a portable heating plant to thaw out the ground, pipe is laid in frozen earth in Boston, Mass. The exact amount of pipe to be laid during a day is determined in advance, and the night before the work begins a portable boiler is hauled to the place and connected with perforated 1½-inch pipes laid on the surface of the ground. A wooden casing, of a width approximately equal to that of the trench, covers these pipes and earth is piled over the joints and other points where leakage may occur. Steam at 40 to 60 pounds pressure is then turned on the pipes, and in this way the earth is thawed so as to be readily removed by the trench gang when it arrives in the morning.

Water Works Expropriations in Canada.

The following is a list of the cities and towns in Canada, prepared by Willis Chipman, C. E., that have from time to time acquired their water works systems by purchase or by arbitration from the private companies that owned and operated the works, and the price then paid by the municipality:

Montreal, P. Q.	1845	.....	.....$250,000
St. John, N. B.	1855	.....	.....
Halifax, N. S.	1861	.....	 275,000
Toronto, Ont.	1873	arbitration	220,000
Kingston, Ont.	1887	"	121,000
Niagara Falls, Ont.	1884	"	17,000
Valleyfield, P. Q.	1887	agreement	
Brantford, Ont	1888	"	65,000
Owen Sound, Ont.	1890	"	55,000
*St. Cunegonde, P. Q.	1891	"	
*St. Henri, P. Q.	1891	"	
Brockville, Ont.	1892	arbitration	138,000
Vancouver, B. C.	1894	"	
Kincardine, Ont.	1894	agreement	40,000
Moncton, N. B.	1894	arbitration	265,000
Chatham, Ont.	1895	agreement	145,000
Cornwall, Ont.	1897	arbitration	86,500
Sherbrooke, P. Q.	1897	"	116,000
Barrie, Ont.	1898	"	78,000
Berlin, Ont.	1898	agreement	102,000

Property Rights in Underground Water.

In a suit brought by Benjamin E. Forbell, a market gardener of Queens county, against the city of New York, the supreme

court decided against the city. Forbell owns a truck farm within about half a mile of the Spring Creek pumping station, which supplies water to Brooklyn. He alleged that the water taken from the land there ruined his business, as the moisture was removed from his vegetables and flowers. He began an action to enjoin the operation of the pumping station and placed his damage at between $4,000 and $5,000 a year. He claimed that before the pumping station was constructed his land was always wet on the surface and was surrounded by ditches that were supplied with water by natural means. The ditches are now dried up and the farm valueless for the purpose to which he before devoted it. Justice Smith, in his decision, says "the underground water on the plaintiff's land was a part of his land; he had a property right in it; it was indispensable to the enjoyment of his land, and he was deprived of the water as effectively by means of these pumps as he would have been by a direct entrance upon the land itself; the property right in waters which flow upon the surface of the ground is no more sacred than property rights in water that flows underground; there can be no escape from the conclusion that the acts of the defendant were injurious to the plaintiff, and that an action will lie for the damages he has sustained thereof." Justice Smith assesses the plaintiff's damages at $6,000, and enjoins the operation of the pumping stations.

A Water Company's Laboratory.

A laboratory for making chemical, biological and bacteriological analyses of the water has been equipped by the Spring Brook Water Supply company at Wilkesbarre, Pa. The water company has some fourteen different sources of supply, and at regular intervals samples of water will be taken from every one of these sources to the laboratory and submitted to a careful and thorough analysis.

A City's Power to Remove Railroad Bridges.

The recent decision of the court of appeals in the Main-st. bridge suit was a victory for the city of Buffalo, N. Y. The common council granted authority in 1881 to the Delaware, Lackawanna & Western Railroad company to build a bridge over Main-st. at Buffalo Plains, at a point about 100 yards north of the Erie tracks. The resolution adopted stipulated that the structure was to be erected subject to the city engineer's approval. It is charged, however, that the company constructed the abutments and did other work without consulting the city engineer. When finished the bridge took up about forty feet of Main-st. In 1892 the common council directed Henry Quinn, the street commissioner, to remove the bridge as a nuisance. The Lackawanna obtained an injunction before he could begin work, enjoining him from interfering with the bridge in any way, pending the trial of the suit. The case was tried before Justice Daniels in the supreme court, who decided in favor of the city, ruling that the city had no power to allow a bridge in the street. The Lackawanna carried the case to the general term, which reversed Justice Daniels's decision, ruling that the general railroad law of 1850 gave the city authority to issue that permission. The suit was then tried before Justice Lambert, who decided in favor of the city. The Lackawanna then carried the case to the court of appeals, which decided in favor of the city. The decision determined the legality of the city's power to remove railroad bridges and other obstructions in public streets without the necessity of bringing an action in court. If the Lackawanna refuses to tear down the bridge the superintendent of streets will do the work.

Minnesota's New Roads and Bridges Law.

It is estimated that the Potter roads and bridges law will effect a gain of 50 per cent. in the benefits derived from the money annually expended on roads and bridges in Hennepin county, Minn., alone. The law places the supervision of road and bridge work in counties of over 200,000 population with the county surveyor making him responsible for it and answerable to the county commissioners. Hennepin county has about 1,000 bridges and 1,500 miles of roads of all kinds. The bridges represent an outlay of more than $300,000. The average life of a bridge is ten years, and the average expenditure per year, therefore, about $30,000. Under the old plan this large sum has been spent without any records being kept and without any systematic inspection of the bridges, many of them becoming dangerous before any one was aware of the fact. Under the new system each bridge will have its record number on the books of the county supervisor's office, and there will be a detail drawing of each bridge, with a statement of the age, name of builder and cost. The work on the roads will be correspondingly systematic and thorough. All roads will be leveled according to a uniform standard and made as permanent and solid as the funds at the disposal of the board will permit.

New Bridge Law in Indiana.

Indiana has a new bridge law which requires county commissioners to have on file in the auditor's office plans and specifications of the proposed work before letting any contract; that the letting of the contract shall be advertised for two weeks in some newspaper of general circulation in the county and by posting notices in five public places; where general specifications only have been adopted by the board, each bidder must present particular specifications with his bid. Contracts must be accompanied by an affidavit that the bidder has not in any way, directly or indirectly, entered into any agreement or combination to prevent free competition in bidding and has not agreed to pay or give any officer anything in connection with letting the contract. The contractor must give a bond on which any laborer or material man who is not fully paid can maintain an action for the amount due him. Commissioners who violate the act by letting contracts without proper advertisement and preparation of plans are liable to a fine of not less than $500 nor more than $1,000 each to which may be added imprisonment for not more than six months. The act does not apply where an expenditure of less than $100 is contemplated. The bill went into effect March 1.

Technical Meetings.

The Civil Engineers' Club of Cleveland elected officers at its annual meeting, March 14, as follows: President, Col. Jared A. Smith; vice-president, Prof. John W. Langley; secretary, Arthur A. Skeels; treasurer, John N. Coffin; librarian, Wm. E. Reed; directors, Joseph R. Oldham and William B. Hanlon.

The Brooklyn Engineers' Club held its regular meeting March 9. The paper of the evening was "Electrolysis; an Unsolved Municipal Problem," by H. S. Wynkoop.

The New England Water Works Association held its regular quarterly meeting at Tremont temple, Boston, Mass., March 8. The papers presented were as follows: "Organisms Which Cause Unpleasant Tastes and Odors in Water Supplies," Prof. W. T. Sedgwick; "Some of the Results of the Systematic Examination of the Water of Public Water Supplies," X. H. Goodnough; "Asterionella; Its Biology, Its Chemistry and Its Effect on Water Supplies," Geo. C. Whipple and D. D. Jackson; "A Brief Account of an Occurrence of Chlamydomonas Alboviridis," Dr. Frederic S. Hollis and H. N. Parker.

The spring meeting of the American Society of Mechanical Engineers will be held at Washington, D. C., May 9-12. F. R. Hutton, secy.

At a special meeting of the Western Society of Engineers, Chicago, Ill., March 15, L. A. Ferguson read a paper entitled "The Development of a Central Lighting Station."

The Montana Society of Engineers held a meeting at Butte, Mont., March 11. A paper, entitled "The Development of Road-Building and Street Pavements," was read by F. W. Blackford. Another meeting will be held in Butte in April.

At a meeting of the Boston Society of Civil Engineers, March 15, officers were elected as follows: President, C. Frank Allen; vice-president, T. H. Barnes; secretary, S. E. Tinkham; treasurer, E. W. Howe; librarian, F. L. Fales; director, A. E. Burton. Descriptions were given, illustrated with stereopticon views, of the Providence, R. I., sewerage and sewage disposal systems, and more particularly of the new sewage pumping plant and new basins for purification by chemical precipitation, which are in the process of construction.

The next meeting of the Iowa Brick and Tile Association will be held in Mason City, Ia.

The fifteenth annual meeting of the Ohio Gas Light Association was held in Springfield, O., March 15 and 16. Officers were elected as follows: President, A. P. Lathrop, Columbus; vice-president, Geo. Whysall, Springfield; secretary-treasurer, T. C. Jones, Delaware; executive committee, C. W. Andrews, Hamilton; J. H. Maxon, Gallipolis.

A Mayor Who Advocates Municipal Ownership.

Mayor Henry of Duluth declares that experience has already demonstrated in that city that municipal ownership of the water and light plants is not a failure. The rates on gas have already been reduced 25 cents per thousand feet and another reduction of 25 cents will be made April 1. On the question of municipal ownership he says: "To say that we are unable to deal with propositions of this kind is to confess that popular government is a failure. To urge that the city is unable to employ men of as much ability as a private corporation is proven false by our public institutions, such as fire, police and street departments. All these are publicly owned, and the popular argument that these can be managed cheaper by private corporations is either made for selfish reasons or out of ignorance, because the contrary is proven in all cities where municipal ownership of public utilities is in vogue, and is again proven in our city in the management of the light and water plant. Comparing expense, we find that many figureheads were drawing large salaries, amounting to thousands of dollars. Under our management every man must earn his sal-

ary. I hold it is the duty of a municipal government that it should supply the people with all public necessities at actual cost in place of allowing a few to profit at the expense of the many, and doing so will create a love of the people for the city in which they live, and in consequence make them better citizens. Let all the people feel that they own an interest in all the city owns, and they will patronize and protect their property. A sign placed on a park ground in the city of Glasgow, Scotland, bearing the inscription, 'Citizens, protect your property,' guards and protects the property more thoroughly than a sign in our parks with the inscription, 'Keep off the grass.' In the one case it reminds the people that they are the owners; in the other case it reminds them that they are trespassers."

New Publications.

Portland Cement, Its Manufacture and Use. By Charles D. Jameson, New York: D. Van Nostrand company, $1.50.

This book first appeared in 1895 and has not been kept up to date in methods of manufacture of Portland cements. It is also somewhat restricted in its definition of Portland cement. However much we may think it desirable to reserve the term Portland for strictly artificial cements, the fact is that the term is applied to all cements of high quality, even though the only claim to any artificial treatment may be the special selection and mixing of one or more kinds of rock so that the result shall have reasonably uniform chemical composition and high tensile strength. A definition that will conform more strictly with actual usage is desirable. Standard methods of testing are described and extracts are given from American, German, French and Austrian specifications. There is a short chapter on the chemical processes in hardening and one on cement testing machines and stone crushers. An excellent chapter is given on the uses of Portland cement for concrete, cement walks, repairing masonry, artificial stone, etc., though it is short.

Some reports of cement tests, in the ordinary manner, with salt water and by hot tests, by students in Iowa university complete the volume.

The book is to be commended as being a good half statement of the fundamental facts regarding Portland cement. It is rather difficult to keep pace with the rapid advance in manufacture and use unless frequent revisions are made. The time is almost here when an exhaustive treatise can be written which shall take up in detail all the points in manufacture, treatment and use.

Elements of Sanitary Engineering. By Mansfield Newman. New York. John Wiley & Sons, 216 pp. 8vo. $2.00.

This is one of the short text books in Prof Merriman's series. He seems to have adopted the plan of putting each independent subject in a book by itself and on account of his beautifully concise and clear way of presenting each subject he is usually able to put the elements of the subject into small space. The present book does not claim to present more than the elements of the subject of sanitary engineering and is therefore not a complete treatise. It is very valuable as a text book for engineering schools wishing to give a full and clear view of the principles on which the best practice is based. It treats of the history of sanitary science; the relations of filth to disease; the purification of water; gives some account of the establishment of various forms of water-supply systems and the principles on which their operation is based; traces sewage from the house fixture through the purification works, even giving a few paragraphs on methods of assessment of cost; disposal of garbage is also treated. It is evident that so large a field can be covered only in the most general way. A complete treatise would require as many books as there are chapters, but for its purpose the book could scarcely be better constructed. Scarcely any of it is beyond the easy comprehension of many city officers and a careful reading of the book would show the value of experience and training in sanitary work.

Report of the Fifth Annual Convention of the American Society of Municipal Improvements, Held at Washington, D. C., Oct. 27-28, 1898. 244 pp.

The officers of the American Society of Municipal Improvements are to be commended for the promptness with which they have prepared and published the report of the convention at Washington in October. The volume of about 250 pages is full of valuable practical papers and discussions and should be in the hands of all interested in municipal works. Many of the papers have appeared in full in the pages of Municipal Engineering and others in abstract. The full papers with the accompanying tables and maps are given in this report.

The report of the committee on municipal data closes with a statement that the committee has been reappointed and asks that criticisms of and additions to its work be sent to the members. Charles Carroll Brown, Bloomington, Ill., is chairman. Those not members who are interested can obtain copies of the proposed schedules for uniform reports of municipal construction and operation of works of the chairman of the committee and are invited to write for them and to offer their criticisms. They appeared in the November and January numbers of this magazine.

MUNICIPAL REPORTS.

Forty-Eighth Annual Report of the Commissioners of Water Works of Albany, N. Y.

Much regret is expressed by the commissioners in not having completed sufficient work on the filter beds to enable them to give the city pure water, but owing to the magnitude of the work and the difficulties accompanying it, they have been unable to accomplish this. The report of George I. Bailey, superintendent of water works, is transmitted, in which he says that early in December contractors had four of the eight filter beds ready to receive the sand and gravel, and the clear water basin was also ready, but the temperature of the water in the river became so low that it was not possible to properly wash and cleanse the sand and gravel before placing it, and the work was, therefore, necessarily abandoned for the season. Had there been two weeks more of reasonably moderate weather four filter beds would now have been in operation, and the city receiving pure water. The establishment of a higher reservoir between the Shaker and Loudon roads is recommended, owing to the rapid building up of the West End.

Eleventh Annual Report of the Board of Water and Lighting Commissioners, Harrisburg, Pa., embracing the Ninth Annual Report of the Board of Reservoir Park Commissioners.

The receipts of the water and lighting department show an increase over those of the previous year. The increased consumption of water during the last year rendered it imperatively necessary that duplicate pumping facilities be provided with the least possible delay, so that the city's manufacturers may feel assured of an abundant and reliable water supply. The present pumping engines have pumped all the water used by the city for twenty-four years. A modern high-duty compound condensing engine of 12,000,000 gals. capacity will probably meet the city's demands for many years.

Annual Reports of the Board of Water Commissioners and of Superintendent Frank E. Merrill, Somerville, Mass.

Superintendent Merrill's report states that the city council appropriated $65,278.88 for water maintenance, and there was a balance to credit at the end of the year of $41.96. For water works extension $27,000 was appropriated and the balance to credit was $29.98. The apparent earnings were $207,195.16.

Twenty-seventh Annual Report of E. L. Dunbar, Superintendent of the Water Department, Bay City, Mich.

The receipts of the department in 1898 from all sources were $22,370.18, and the expenditures $21,730.35; balance in water works fund Dec. 31, 1898, $12,859.43. The total net cost of operating the pumping engines, including labor, fuel, supplies and repairs, was $7,325.53. Superintendent Dunbar reiterates his former recommendations of the necessity of a new intake, which should bring the supply from the west side of the bay.

Report of Deputy Director of Public Improvements Zuber, also Secretary and Treasurer of the Water Works Department, Columbus, Ohio.

The receipts for the year were $159,893.67; operating expenses, repairs and refunds, $95,360.43; net profit, $64,533.24. This, with a balance of $2,616.25 on Jan. 1, has been expended for construction, and the deficit of $28,529.23 Jan. 1, 1899, has gone for the same purpose, making a total expenditure of $95,678.72, for construction for the year.

Annual Report of Col. George A. Diteweg, Superintendent of Sewers, Peoria, Ill.

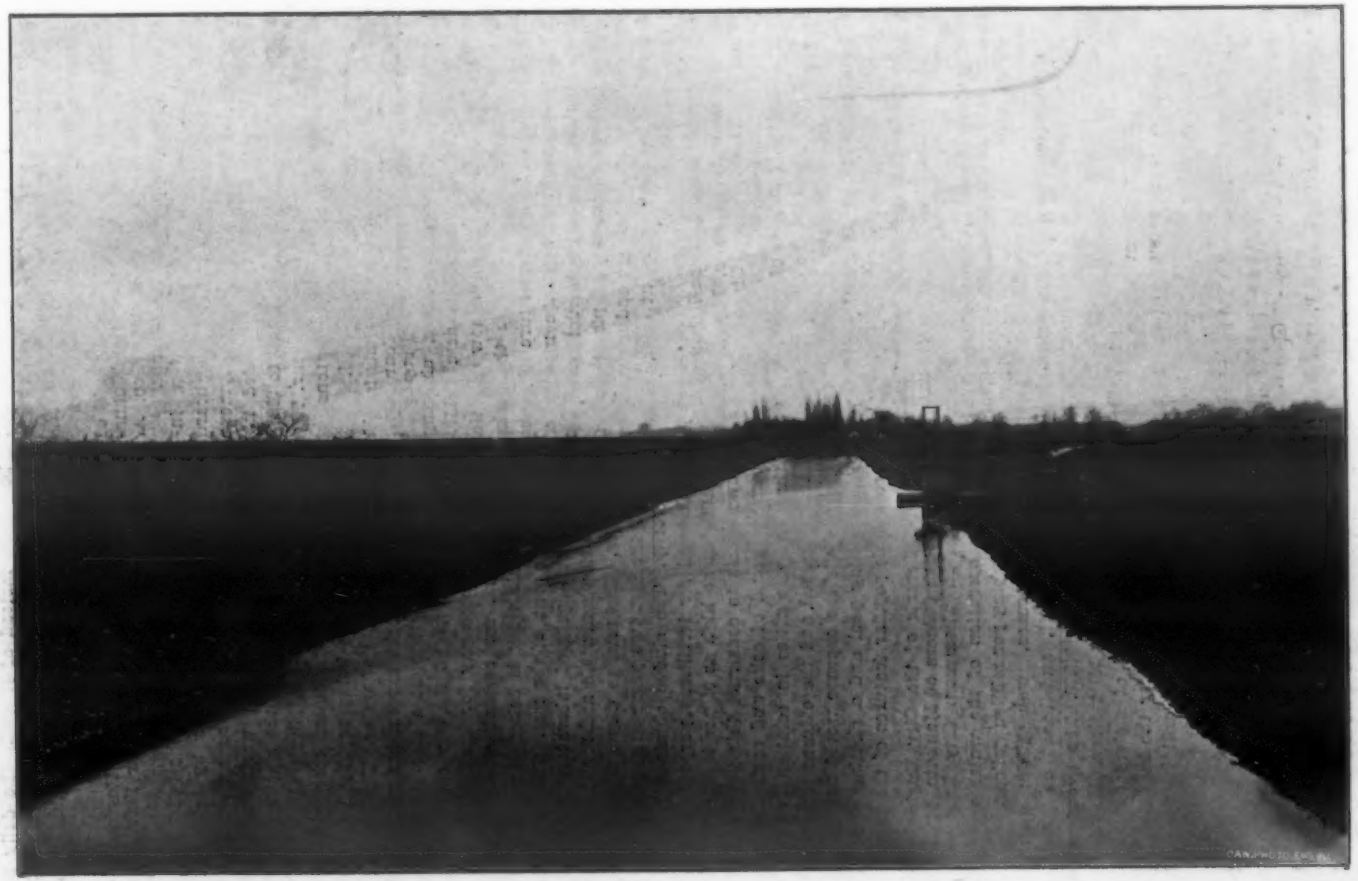
Peoria has in use 70 miles of sewers, of which 19.98 miles are brick and 50.2 miles are pipe sewers. They are flushed regularly once a month. Col. Diteweg says the method of flushing is cumbersome, expensive and inadequate, owing to the refusal of the water company to allow the city to connect the automatic flush tanks with the company's mains, which compels the department to use fire hose attached to hydrants to do the work. The department keeps constantly employed a force of men to clean, keep open and in repair more than 830 catch basins. The speedy adoption of a suitable system for District No. 1 and the construction of a sewer in the Chestnut-st. district is earnestly recommended.

Annual Report of the Water Department of the City of Rockford, Ill., for 1898. By W. M. Kimball, supt.

This report is devoted largely to the work for increasing the water supply of Rockford, which is fully described in a special article in this number of Municipal Engineering.

Sixteenth Annual Report of the Board of Water and Lighting Commisisoners of the City of McKeesport, Pa., for the Year 1898. Edwin Soles, supt.

McKeesport now has 575 meters in use, having increased the number 100 during 1898. The average revenue per meter was $19.60. Mr. Soles thinks the only proper method of selling water is by meter measurement, and if the system were better understood he believes that it would be more generally adopted by the public. "A consumer may use all the water necessary," he says, "and will pay less when metered than by schedule." The McKeesport supply is from wells, and Mr. Soles says that it is an unqualified success. Five additional wells were put down



FILTERING BASIN, BURLINGTON BEACH, HAMILTON, ONTARIO.

in 1898, at an expense of $3,700, making the total cost of the well system, including two acres of ground, $25,245. The revenues were increased, on lower rates, $3,427 in 1898, and expenses reduced $572. The cost of fuel for three years was: In 1896, $4,876; in 1897, $3,406; in 1898, $2,306.

Fourth Annual Report of the Board of Water Commissioners of the Ctiy of Johnstown, N. Y., for the Year 1898. Geo. A. Stewart, pres., and C. C. Abell, supt.

Liabilities amounting to $46,000 were incurred by diversion of water, but the board succeeded in settling all claims by payment of a lump sum of $22,000. The bonded indebtedness on the plant, amounting to $165,000, was reduced $20,000 during the year. The reservoir was cleaned, over 1,500 tons of muck and dirt having been removed.

Report of the Board of Park Commissioners of Wilmington, Del., for the Year 1898. Theodore A. Leisen, engineer and supt.

A number of fine illustrations, showing park views, add to the attractiveness of Mr. Leisen's report, and he shows how a little work has done much to improve the parks under his charge at an expenditure of about $10,000. This work embraced the making of paths, planting of trees, construction of pavilions, placing of seats and picnic tables, the building of small bridges and the opening of a swimming pool, which at once became a very popular feature.

Fourth Annual Report of the Board of Public Works of Little Falls, N. Y., for 1898. Timothy Dasey, pres.; Stephen E. Babcock, city engineer.

Mr. Babcock complains of enormous waste of water by consumers, and advocates the use of meters. A new storage reservoir with a capacity of 500,000,000 gallons was completed during the year. The filter beds will be made this spring. Sewer extensions were made during the year at an expense of $13,922.

Twenty-sixth Annual Report of the Water Board of Lowell, Mass., for 1898. George Bowers, city engineer; Robert J. Thomas, supt.

The importance of meters is strikingly indicated by the statement of Supt. Thomas that, while 482 meters were added during the year, making a total of 4,866, this is only 47 per cent. of the total number of services and yet yields 54 per cent. of the earnings. If the total quantity consumed were paid for at the regular price for metered water—14 cents per 100 cubic feet, less 10 per cent. discount—the income of the department would be $412,368 instead of $194,291. The daily per capita consumption was 78 gallons. The cost of pumping per million gallons was $25.74.

Annual Report of the City Engineer of Hamilton, Ont., for the Year 1898. E. G. Barrow, City Engineer.

Hamilton is renewing the distribution system of its water works by introducing larger mains, and this was an important part of the construction work during the year. The abatement of the smoke nuisance from the high level pumping station by the use of a smoke consumer, costing $100, is noted. Meters are being rapidly introduced to check the waste of water. The total cost of the water works system has reached $1,722,972. The city bought a steam road roller during the year, and the city engineer says that it will soon pay for itself. There is a great demand for cement sidewalks, and much of this work is being done. The city pays 40 per cent. of the cost. The city maintains a well-equipped laboratory for testing construction materials and for the analyses of water. The sewage disposal works built during the last two years are operating satisfactorily. The sludge obtained from it is in demand for fertilizing purposes and sells readily at as high as $1 per ton. Mr. Barrows wants to construct this year some filters composed of coke and coal. He thinks that the impurities in solution would be much lessened and the effluent improved by them, while the expense would not be large. A swimming pool and a skating rink have been made popular features of the park.

Annual Reports of the City Engineer and the Health Officers of Mankato, Minn., for 1898. J. R. Thompson, City Engineer.

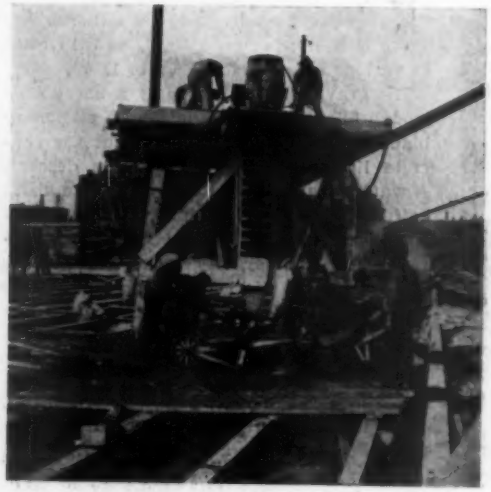
In the operation of the water works the cost of pumping per million gallons, based on running expenses, was $14.19; including maintenance, $21, and based on total expense of system, $49.76. The average daily use per capita was 140 gallons. Mr. Thompson advises the use of meters as the best means of "preparing for the inevitable time when the water supply will be inadequate to the demand."

MACHINERY AND TRADE.

Power for New York and Philadelphia

The Electric Company of America, recently incorporated in New Jersey by William C. Whitney of New York and the Elkins-Widener and Dole interests of Philadelphia, has purchased 400 acres of coal land in the vicinity of Scranton, Pa., on which it will erect an immense plant for the purpose of transmitting electric power to Philadelphia and New York. The percentage of loss in

sending the power this distance is said to be in inverse ratio to the amount of money spent in copper for wire and cables to conduct the electricity. While the initial cost will be great, it is claimed that the profits to be made after the system has been installed will be large. The cost of fuel will be small, and by using an improved process it is claimed culm will make a good fuel.



A Portable Gravity Concrete Mixer.

It is a remarkable fact that nearly all the machines that have been designed to replace hand work have been constructed comparatively complicated at first and simplified afterward. For example, there have been a number of types of steam concrete mixers to supplant hand mixing, and recently a mixer for concrete that needs no other power than gravitation to accomplish the work perfectly has been invented by a Boston building contractor named F. B. Gilbreth. It is a recognized fact that there is no economy in using a steam mixer, except on works of magnitude, because the saving in mixing is offset by the expense of teaming and setting up.

The portable gravity concrete mixer, as it is called, weighs about 400 pounds. It can be set up in ten minutes by two men. It is claimed that there is absolutely no expense for power, no expense when idle, and while it is economical to use it on small work, it is also most economical and satisfactory on large work. The accompanying cuts show two gravity mixers in use on the new bridge across the Charles river now being built

under the supervision of the Boston Transit Commission. Here the material is hoisted by derrick from the street below the bridge and dumped upon a platform at the mouth of the mixers.

These mixers are made to use either where there is a drop, or on a level, as they come in various lengths from 4' 0" to 10' 0".

The gravity mixer is simply a sheet steel trough filled its entire length with stationary blades and pins, so arranged that the concrete literally mixes itself in its descent. A water spray strikes the dry concrete about half way down the length of the trough, accomplishing dry and wet mixing simultaneously. The gravity mixer is gaining favor rapidly, and has been accepted by the United States government for concrete on fortifications.

The Illinois Steel Company's New Slag Cement Plant.

The new cement plant being built by the Illinois Steel company at South Chicago will probably be completed by August, when the making of cement at the North works will eventually be discontinued. The main building will be 150 ft. x 150 ft., and situated at the mouth of the Calumet river. It will have engine, boiler and store houses, all the buildings covering an area 300 ft. x 500 ft. The cement manufactured by the Illinois Steel company is hydraulic cement from blast furnace slag known as "Steel Portland" because its high tensile strength has been shown to be particularly suited for masonry and concrete foundations for buildings and bridges, retaining walls and river and harbor work. The process of making the material is described as follows: The slag, as it comes from the blast furnace, flows into an open trough, which ends above a large tank of water. A nozzle under the trough directs a stream of cold water, under a pressure of about 80 lbs., against the falling slag, causing it to break up into small granules. The chilled slag is then conveyed to rotary dryers, from which it passes into a hopper placed above a row of Griffin mills. In passing through these mills it is ground fine, and it is then raised to hoppers placed over a row of Davidsen tube mills. In the new plant there will be 20 tube mills. These consist of horizontal cylinders, lined with porcelain tile and containing about one-half their volume of selected flint pebbles and about 2 in. in diameter. The slag, prepared lime and other ingredients are fed to the mill through a trunnion at one end, and after traveling the length of the cylinder are discharged at the opposite end. These mills make about 27 revolutions a minute, and the grinding and mixing are effected by the motion of the pebbles. The material discharged by the tube mills is the finished cement, and its fineness varies with the time of passing the last mill. This is under the control of the operator, and all material is required to be of such a fineness that 95 per cent. of it will pass through a standard sieve containing 40,000 meshes per square inch. The objections claimed for European slag cements—irregularity and slowness of setting—are avoided by the Illinois Steel company by using more pure and regular ores, and by subjecting each lot of slag to chemical analysis before it is used. The slowness of setting is said to be overcome in the process of making and the results of many tests would seem to show that in this respect it compares very favorably with other cements. The slag cement is being used by a number of railroads, and large quantities are being used in the new locks on Red river, near Plaquemine, La., and in the new sewerage system at New Orleans.

Consolidation of Independent Telephone Companies.

A consolidation of the independent telephone manufacturers into one strong organization is proposed. A number of options have been secured and a syndicate of Chicago men is endeavoring to put the plan into operation. Among those interested outside of the telephone manufacturing field are Chas. D. Irwin, W. P. Williams, Chas. T. Trego and Jesse P. Lyman. The Illinois Trust company of Chicago is said to have under consideration the question of underwriting the proposition.

The New Cast Iron Pipe Trust.

The United States Cast Iron Pipe company, New York City, has completed its organization and the company has formally assumed control of its properties. A board of directors has been elected as follows: Colgate Hoyt, A. C. Overholt, B. F. Overholt, L. B. Lemoine, George B. Hayes, C. E. Burke, E. C. Fuller, W. C. Proctor, B. F. Haughton, Geo. K. Long, A. A. Callahan and A. C. Miller. Officers have been elected as follows: President, A. C. Overholt; vice-president, A. A. Callahan; secretary, W. B. Haughton; treasurer, Geo. Davis. The company is capitalized for $30,000,000, equally divided between common and preferred stock.

Consolidation of Sewer Pipe Companies.

The consolidation of clay sewer pipe companies was effected March 27. The consolidation embraces important interests in

Ohio, Pennsylvania and New York and involves a purchase of over fifty plants. The deal involves about $10,000,000. More than 80 per cent. has been underwritten by the local interests of the various plants.

A Machine for Testing Road Materials

The John Hopkins university has received a machine which will be used by the road division of the state geological survey in testing the cementing power of Maryland stones with regard to their value as road material. By the use of the machine stone dust is compressed into a small cake, after which another machine having a small hammer, similar to a pile-driver, breaks apart the stone thus cemented. The cohesive power of the stone is indicated by its resistance to the blows of the hammer.

Consolidation of Electric Light Companies.

The United Electric company of New Jersey was formed at Newark, N. J., March 3 for the purpose of uniting all the electric light, heat and power companies of Essex, Hudson, Union, Middlesex, Bergen, Pasaic and Norris counties under one management. The incorporators are F. M. Stillman, Rahway; W. J. Davis, Harrison; Thos. J. George, Newark. The corporation has a capital of $20,000,000.

Consolidation of Portland Cement Mills.

The International Cement company, which is for the consolidation of the cement industries of the United States, will have an authorized capital of $50,000,000, of which $25,000,000 is to be 7 per cent. cumulative preferred stock and $25,000,000 common stock. Amzi L. Barber of the Barber Asphalt Paving company and Chas. R. Flint are the chief promoters of the combination. The concerns to be taken into the combination are all makers of Portland cement, their plants being in southern Michigan, the Lehigh valley in Pennsylvania, near Chicago and in the state of New York.

A Stationary Engine That Beat All Records.

The Murray Iron Works of Burlington, Iowa, had one of their 24 in. x 48 in. Sioux Corliss engines at the Omaha Exposition that made a run probably without precedent in stationary engine practice. It was operated twenty-four hours per day for fifty days, or 1,200 consecutive hours, with one stop of thirty minutes. For eighty days it ran twenty-three and twenty-four hours per day, as the authorities desired, and its total run was 2,983 hours in 155 days; an average of more than nineteen hours per day, from the dull days at the start to the rush at the finish.

Growing Use of Triple Expansion Pumps.

The New England Water Works Association held a meeting at Boston, Dec. 14. The subject of pumping engines was discussed. President F. F. Forbes, of Brookline, Mass., in opening the meeting called attention to the rapid extension of the use of triple-expansion pumps in the last eleven years. He presented figures of the capacity in gallons of such engines made during each year, as follows: 1886, 6,000,000; 1888, 123,500,000; 1889, 29,000,000, 1890, 29,000,000; 1891, 37,000,000; 1892, 96,250,000; 1893, 97,000,000; 1894, 60,500,000; 1895, 116,000,000; 1896, 187,375,000; 1897, 435,750,000. He also drew comparisons between the results obtained at different times at the low-service pumping station at Brookline. In 1890, before the installation of a triple-expansion engine at that place, 322,767,796 gallons of water were pumped with a total consumption during the year of 1,141,175 pounds of coal. In 1894, when a triple-expansion engine was in use part of the time, 481,633,366 gallons of water were pumped, and 998,107 pounds of coal consumed. In 1897, with a triple-expansion engine in use all the time, 508,174,048 gallons were pumped and only 761,826 pounds of coal consumed. Other papers read were as follows: "Possibilities of Economy in Pumping Engines as Based on the Latest Accomplishments," George H. Barros, Boston; "The Advantage of Triple Expansion Pumping Engines," J. M. Betton, Brooklyn, N. Y.; "The Latest Designs in Pumping Machinery, Comparing Same With Practice of Twenty Years Ago," by representative of the Edward P. Allis Co., of Milwaukee, Wis., and of Henry R. Worthington, of Brooklyn, N. Y.; "The Application of Oil and Gasoline Engines to Pumping Machinery," Freeman C. Coffin, Boston; "Comparison Between Low and High Duty Pumping Engines on a Small Water Works Plant," John E. Smith, Andover, Mass.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.)

619,737—Feb. 21, 1899—Dumping Door for Dredging Vessels—Joseph Edwards, New York, N. Y. The door has an adjustable hinge by which it may be adjusted toward and from its seat.

619,810—Feb. 21, 1899—Treating Bagging for Asphalt—R. D. Upham, New York, N. Y.

The bagging is first coated with a clay paste. This is partially dried and the molten asphalt then poured in.

619,838, 619,839—Feb. 21, 1899—Filter—Z. F. Potter, Baltimore, Pa., assnr., to Baltimore Filter company, same place.

619,934—Feb. 21, 1899—Wooden Block Pavement—Joseph Buchtel, Portland, Ore. Each block has stepped ends, the steps being at the bottom on one end and at the top on the other side so that adjacent blocks will overlap. Each block is provided with drain grooves, both longitudinal and transverse, on its lower face and the end blocks of each transverse series are provided, at their lower sides, with longitudinal gutters.

620,028—Feb. 21, 1899—Mixer for Cement, Etc.—F. B. Gilbreth, Boston, Mass., assnr. One-half to L. C. Wason, Brookline, Mass. A trough through which the material gravitates, the material being deflected in its passage by pins projecting toward the bottom of the trough.

620,034—Feb. 21, 1899—Bicycle Path or Sidewalk Leveler and Roller—S. P. Hedges, Greenport, N. Y.

620,102—Feb. 28, 1899—Tunneling Device—B. F. Carpenter, Roselle, N. J.

620,458—Feb. 28, 1899—Apparatus for Drying and Burning Garbage—J. J. Kennedy, Philadelphia, Pa. The garbage is supported by a grate above the furnace, means being provided for so supporting the garbage as to always leave draft passages therethrough.

620,555—Feb. 28, 1899—Portable Asphalt Plant—J. A. McIntyre, Denver, Col. A plant mounted on two cars and having a peculiarly constructed intermediate platform for supporting the mixer. Also a telescoping hot-sand elevator-housing.

620,584—Mch. 7, 1899—Automatic Chair-Mat for Cross-Jetty Work—W. H. Harrelson, Kansas City, Mo. The seat portion is hinged to the back, the seat and back being composed of transverse bars and longitudinal strands of wire.

620,592—Mch. 77, 1899—Ornamental Fountain—P. C. Just, assnr. ½ to J. M. Roach—Same place. Means for throwing a flat sheet of water and means for projecting a picture upon said sheet.

620,635—Mch. 7, 1899—Dredging Machine—J. J. Batman, Sunbury, Pa. The suction pipe is provided at its lower end with a sprocket-chain which carries outwardly projecting spans. Means are provided for reciprocating the arigator or scraper thus formed.

620,725—Mch. 7, 1899—Grading and Ditching Machine—W. H. Fidland—Nicollett, Minn. The excavated material is thrown to one side, or may be loaded on to a wagon by means of a transverse conveyor to which the material is delivered by the scraper.

Asphalt Apparatus—Frank Burger, Brooklyn, New York City. This invention provides an apparatus for compounding asphalt for use on pavements. The apparatus embodies a wheeled frame on which are mounted a sand-heating and drying furnace, boiling and mixing tanks for pitch-asphalt and measuring and amalgamating devices by which to amalgamate the sand and pitch-asphalt. All parts of the apparatus are connected to work in unison by gearing driven from an engine on the framing.

Trade Notes.

A fire in the bindery of the Brickbuilder, Boston, Mass., destroyed the March edition.

The Western Portland Cement works, Yankton, S. D., will commence operations about May 1.

The Eastern Paving Brick company, Catskill, N. Y., contemplates operating its plant to its fullest capacity.

The erection of a brick and tile factory at Sioux Rapids, Ia., is contemplated by J. M. Russell of Storm Lake, Ia.

A movement is being revived in Minneapolis, Minn., to establish a plant for the manufacture of brick paving.

The Western Clay Manufacturing company, Portland, Ore., resumed operations March 1 at its sewer pipe factory, which had been closed since Jan. 1 for repairs.

The abundance of coarse marsh grass in the vicinity of Winona, Minn., has led parties of that city to investigate the method of manufacturing paving blocks of that material.

Sparrow, Freidenburg & Co., New York City, have succeeded the Manhattan Cement Co. and will continue the business at the same address, 15 to 25 Whitehall-st., New York City.

The deposits of the marl beds at Clarendon, N. Y., are said to reach, in some places, ten feet in depth and will produce 1,000 barrels of cement daily for a century or more. The beds cover 400 acres.

The Lawrence Cement company of Pennsylvania, Harrison building, Philadelphia, is distributing among the trade a very handsome reminder of their "Dragon" Portland cement in the shape of a paper cutter bearing their name.

The building of the two new additions and the purchase of seven more rotaries, contracts for which have been let, will increase the capacity of the Michigan Portland Cement company, Coldwater, Mich., to 1,500 barrels per day.

The Compagnie Generale des Asphaltes de France, Ld., 32 Broadway, New York City, has awarded the contract for erecting a new pier on their property, foot of Seventh-st., borough of Queens, to James I. Leary, 32 State-st., New York City, for about $10,000.

The Union Engineering & Contracting company has been incorporated to construct water works, gas works, gas plants, electric light, heat and power plants and bridges. The principal office will be in Orange, N. J. The incorporators are: Charles Baker, jr.,

Cranford; William H. Fritchmann, Brooklyn, N. Y.; Maurice S. Decker, Orange.

The company of Detroit capitalists which has purchased land fronting on Big Turkey Lake, near the Steuben-Lagrange county line, and holds option on several hundred acres more for the manufacture of cement, is securing right-of-way on which to build a spur track connecting with the Wabash railway at Helmer. A second company is said to be locating on Little Turkey Lake.

The outlook for the establishment of a Portland cement plant near Mosherville, Mich., is said to be very good. The marl beds were examined recently by a party composed of F. M. Stewart, T. M. Fant, Dr. W. H. Sawyer, Geo. D. Harding, C. F. Stewart, Hillsdale; Messrs. Jordan, Byres and Beebe of Jackson and Bunce of Bronson.

The International Steam Pump Co. will acquire the control of the business of the following corporations: Henry R. Worthington, Brooklyn, N. Y., assets, $6,148,355; Blake & Knowles Steam Pump works, East Cambridge and Warren, Mass., assets, $3,178,000; Deane Steam Pump works, Holyoke, Mass., assets, $1,155,000; Laidlaw-Dunn-Gordon company, Cincinnati, assets, $800,000; Snow Steam Pump works, Buffalo, assets, $700,000.

C. S. Caurson, formerly superintendent of the water works department at Springfield, O., has invented a device to prevent the damaging of water mains by electrolysis, which consists simply of a rubber joint to be placed between sections of the mains. The rubber joint is absolutely waterproof and prevents the pipe from carrying any electric currents. The joints would only have to be placed at a distance of 300 or 400 feet apart.

A pneumatic gasoline motor street sweeper has been invented by A. F. Smith of Indianapolis, Ind. The wagon is run by a gasoline engine, which also operates two circular sweepers running in opposite directions, or in toward each other, thus catching between them the dirt from the street and carrying it up until an air draught catches it and takes it up into a box at the rear. The engine is supplied from a tank under the operator's or brakeman's seat at the front. The inventor says seven pints of gasoline will operate the machine ten hours. A machine is being manufactured in St. Louis.

A bicycle path or sidewalk leveler and roller has been invented by Samuel P. Hedges of Greenport, N. Y. The machine is designed to be controlled by a single man, and is so constructed that when the scrapers are to be brought into contact with the ground the movement of the controlling-lever will be toward the operator, thus enabling him to work the scraper blades to great advantage at the least expenditure of power. Shoes are pivoted at the front portion of the machine which are intended to support this portion. These shoes are shaped so as to carry the machine over small or moderately large depressions in the path or sidewalk, enabling the scraper blades to act evenly upon the ground.

Mr. F. A. Hetherington, of Indianapolis, Ind., is the owner of a number of patents which cover the portable asphalt paving plant which he manufactures. His earliest patent, which was issued in 1895, has for some time been in dispute, the Barber Asphalt Paving company having claimed that one of its employes is entitled to the patent. The commisisoner of patents has recently decided, in the interference case of Kasson vs. Hetherington, that Mr. Hetherington is entitled to the patent. This is the third decision which has been rendered in favor of Mr. Hetherington.

The Beaver Portland Cement company has been incorporated to manufacture Portland cement in Canada at Dry Lake, near Marlbank, Ont. The management will be under William G. Hartranft of Philadelphia. The officers of the company are: President, James Dobson, Philadelphia; vice-president, R. Beverly of the Commercial Wood and Cement company, New York and Philadelphia, managing director and treasurer, R. T. Hopper, Montreal. The main office will be in the Canada Life Building, Montreal. The Commercial Wood and Cement company has been appointed sole agent for the cement and their office will also be in the Canada Life Building, Montreal, under the management of J. F. Twamley.

A pure water still has been invented by Nelson Stow of Binghamton, N. Y. It consists of a condenser and a boiler, between which is a perforated cut-off. When the still is in operation the water in the top of the condensing tube is heated by the steam from the boiler. The water first passes through the tube into the condenser, which the steam from the boiler keeps hot at the top, and this in turn heats the water that feeds the boiler through a small tube. The heating of the water causes all the lime and vegetable sediment to rise to the top of the water, and it passes into the boiler, thus doing away with the serious objection of drawing from a boiler water that is roilly and filled with the decayed vegetation that drifts into the streams.

SELECTIONS FROM THE PRESS.

THE MAYOR OF SAGETOWN.

Hain't ever been in Sagetown. Say, you've made a big mistake!
I doubt ef you could find a place 'at's half ez wide awake.
It's jest a-boomin' night an' day an' spreadin' in extent,
All owin' to the Mayor who's a enterprisin' gent.

The town received its cognomen from sagebrush which, you know,
Is growin' all about it, an' folks used to call it slow,
Till Doc. Briggs happens 'long an' says he thinks he'll settle down,
An' straightway gives it out 'at he's the Mayor of the town.

We'd never hed a mayor—never thought it worth the while
Till Doc. shows up an' tells us we are 'way behin' the style.
He holds no 'lection but he shows 'at he can shoot to kill,
An' says, "Now I'll be Mayor er, 'y gad, we'll see who will!"

Doc. 'lows 'at 'lections is a fraud, an' men 'at hez the rocks
Hev got it in their power fer to stuff the ballot-box.
"While I'm runnin' things," sez Doc., an' says it firm an' flat,
"I'll steer the town to suit myself an' let it go at that."

Doc.'s simple in his methods—says 'twould complicate his plans
To hev some other officers a-tyin' up his hands.
He's mayor, clerk, town treasurer, judge, coroner, an' all.
Fer when it comes to gov'ment, why Doc. hez got the call.

Doc. tries to git a drunk at 3:00 a. m., one winter night,
An', strange enough, they ain't a joint 'at shows a gleam o' light.
An' then Doc. frames a law which says 'at when, by night er day,
A joint locks up, it's got to pack its traps an' git away.

An' then Doc. moves his office to the —g Red Front Saloon,
An' business at that fount o' joy is rushin', mighty soon,
Fer everybody knows 'at Doc. is rakin' in his share,
An' that it's safer all erround to buy their whisky there.

Doc.'s great fer havin' hanging's; says they boom the town a heap,
An' draw a crowd from fer an near; an' more 'an that, they're cheap.
An' so he hez one every month an' does the best he can
To hev the victim somethin' more than jest a common man.

One time a blamed Perfessor from some down-cast college place,
He criticized Doc.'s grammar an' it proved a fatal case.
Doc. advertised his hangin'-bee fer all 'at 't was worth—
"The first bang-up Perfessor 'at was ever hung on earth!"

Doc. made our town the rendyvoo fer cow-boys fer an' near,
But still it wa'n't the county-seat till Doc. he says, "See here,
Be we a-goin' to set erround an' let some other place
'At ain't got half our stock o' nerve throw gravel in our face?"

So one night Doc. sort o' steers a gang o' loyal men
To that there rival layout, an' when mornin' comes agen
Doc. gallops proudly up an' down through Sagetown's only street
A-shoutin', "Hear ye! Hear ye: We hev moved the county-seat!"

O' course some folks don't cotton to Doc's enterprisin' ways,
But any one 'at ever sees Doc. make his pistol plays
An' watches him come out on top in every sort o' fight
Will never hesitate to say he thinks 'at Doc.'s all right.

Doc.'s goin' to be the gov'ner o' the state, er so I've heard.
Well, any place 'at Doc. shows up they'll find 'at he's a bird.
An' some day he'll be president, an' then, I'll bet my soul,
This land, inside o' thirty days, 'll reach from pole to pole.

—Nixon Waterman in L. A. W. Bulletin.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Anderson, Ind.—Mayor Dunlap decided, March 21, upon creosote blocks on 4-in. concrete base for paving Ninth-st. The property owners who desire brick will enjoin the city from proceeding with the work.

Lima, O.—Judge Cunnigham decided against the city of Lima, O., March 17, in its injunction suit to restrain the awarding of a contract, for paving W. North-st., to the Columbia Construction company, of Syracuse, N. Y.

Toledo, O.—The city engineer was recently authorized to correspond with brick manufacturers and ascertain if they would donate sufficient brick to make a test of the brick in a block which the city proposed paving with the different materials.

New York City—The streets around the

building in the Brooklyn Navy Yard will be paved with live oak blocks, cut from large quantities of large oak that was stored at the Brooklyn Navy Yard prior to the opening of the civil war. The material was used at that period in the construction of vessels.

Baltimore, Md.—Mayor Malster has signed the ordinance which provides for the use of improved paving materials only, and designates these materials as Belgian blocks, sheet asphalt, block asphalt, mosaic blocks and vitrified bricks. It provides, however, that property owners in the Annex may have their streets macadamized where no improved pavements have hitherto been laid.

Indianapolis, Ind.—Suit has been instituted in the superior court for the purpose of testing the constitutionality of the new Strong law, relating to street improvements. An injunction has been asked, to restrain the city and board of public works from proceeding with the improvement of Seventeenth-st., from Central to College-ave. The plaintiff contends that the law is void because it gives only the owners of property abutting the streets to be improved the benefit of the provision that the improvement must cost not to exceed 25 per cent. of the value of their property; because it provides that only such owners may say what kind of improvement shall be made, while owners of property in the intersecting streets must pay for the improvement of the intersections, and because a minority may dictate the kind of improvement as against the wishes of a majority of the property owners.

CONTEMPLATED WORK.

Sharon, Pa.—Paving is proposed for E. State-st.

Mt. Vernon, O.—Asphalt paving is contemplated for Gambier-st.

Orange, Mass.—The town has voted $3,000 for macadamizing.

Auburn, N. Y.—Asphalt paving has been asked for South-st.

Omaha, Neb.—Ordinances have been passed for paving Capitol-ave.

Van Wert, O.—Brick paving is proposed for the main business street.

Sioux City, Ia.—Asphalt paving has been ordered for several streets.

Los Angeles, Cal.—Asphalt repaving has been proposed for Broadway-st.

Shelby, O.—The city council is considering the question of paving Main-st.

Hamilton, O.—An ordinance has been passed providing for cement sidewalks.

Richmond, Va.—Resolutions have been passed to improve about thirty streets.

Ashland, Wis.—Paving has been asked for Second-st., from Orange to Cottage.

Sing Sing, N. Y.—The question of appropriating $4,000 for highways will be voted on.

Pekin, Ill.—About 4,000 sq. yds. of paving is contemplated. J. R. Siebert, cy. engr.

Hicksville, O.—The property-owners have petitioned for the paving of High-st.

Sharon, Pa.—A petition has been circulated asking that E. State-st. be paved.

Peru, Ind.—Paving is contemplated for Broadway. Both brick and asphalt is advocated.

Gloucester, Mass.—The council has passed ordinances to macadamize three streets.

Painesville, O.—Paving is petitioned for for St. Clair-st., from Main to Washington.

Foster, R. I.—This town has voted to expend $3,000 in improving the highways.

Fall River, Mass.—The committee has voted to appropriate $5,000 for concrete paving.

Warren, O.—The city council declared its intention March 8 to improve High-st.

Barboursville, Ky.—The question of issuing $10,000 bonds for macadamizing will be voted on.

Galion, O.—Some street paving is contemplated during next summer. C. H. Briggs, mayor.

Atlanta, Ga.—The street committee reported favorably, March 20, on macadamizing thirteen streets.

Springfield, O.—The question of paving N. Fountain-ave. with asphalt is being considered.

Toledo, O.—A large amount of street paving is contemplated for the coming summer.

Erie, Pa.—About nine or ten blocks of brick or asphalt paving is contemplated. B. E. Briggs, cy. engr.

Camden, N. J.—An ordinance has been passed to pave Fifth-st. with asphalt. H. C. Kramer, cy. clk.

Des Plaines, Ill.—Plans and specifications are being prepared for paving Ellinwood-st. by R. C. Huston.

Pueblo, Col.—A bill passed by the legislature will enable this city to pave certain streets.

Ottumwa, Ia.—About two miles of brick and asphalt paving is contemplated. L. C. Brady, asst. cy, engr.

Waterville, Me.—Macadam paving and concrete walks are contemplated. J. E. Getchell, cy, engr.

Rye, N. Y.—The board of supervisors has authorized the town to morrow $10,042 for street improvements.

Trenton, N. J.—The $150,000 apropriation bill for stone road construction has been signed by the governor.

Biloxi, Miss.—The question of issuing $25,000 of bonds for street improvements will be voted on April 8.

Vailsburg, N. J.—The street committee was authorized, March 15, to curb the borough streets.

Chicago, Ill.—Halsted-st., from Van Buren to the river, will be paved with brick or granite.

Dubuque, Ia.—Mayor Berg has been authorized to sign the resolution ordering the paving of Main-st.

Youngstown, O.—A resolution has been passed to pave Himrod-st., from Fruit to Oak. F. C. Brown, cy. clk.

St. Paul, Minn.—An ordinance was passed providing for cement sidewalks throughout the city, March 16.

Anderson, Ind.—The question of paving Fifth-st., from Meridian to Jackson, is being agitated.

Bloomfield, N. J.—The question of bonding for $75,000 to build fifteen miles of macadam roads will be voted on in April.

Newark, N. J.—The Essex County Park commission will be petitioned to build a speedway, 200 feet wide, in Branch Brook park.

Middletown, Vt.—The question of macadamizing the streets is being considered.

Joseph Merriam, Walter B. Hubabrd. com.

West Alexandria, O.—The question of paving Dayton-st., from the business part of town, is being considered by the council.

San Francisco, Cal.—Artificial stone sidewalks will be constructed in portions of nine streets. M. F. Fragley, supt. sts.

Waverly, O.—A proposition to issue bonds for extending and improving Lock and Second-sts. will be voted on in April.

Akron, O.—Legislation has begun for paving Market, Summit, Fay, Kirkwood, Buckeye and Johnston-sts. John W. Payne, cy. engr.

Beloit, Wis.—A petition has been presented to the council to pave the west side of Third-st., between D and E.

Guntersville, Ala.—The issue of $100,000 of bonds, for the construction of macadamized roads, bridge, etc., has been authorized.

Denver, Col.—Plans and specifications have been adopted for paving Race-st., estimated cost $39,339.66.

Goshen, Ind.—Brick paving is contemplated for several streets during 1899, according to press reports.

Milwaukee, Wis.—Brick paving is contemplated for Cherry-st., from Third-st. to the tracks of the Milwaukee R. R.

Rochester, N. Y.—The North Clinton-st. property owners decided, March 20, in favor of Medina block paving for that thoroughfare.

Saginaw, Mich.—The paving of Lapeer-st. with asphalt or brick, and Jane-st. with brick or macadam is contemplated.

Camden, N. J.—Ordinances passed recently provide for about $70,000 worth of asphalt paving and one street of brick.

Marion, O.—A resolution has been passed to pave Oak-st., between Center and Owen, with brick. J. I. Beatty, cy. clk.

Sandusky, O.—A resolution was adopted, March 20, to pave N. Depot-st. with brick, sheet asphalt or block asphalt.

Elizabeth, N. J.—The city council has decided to repave the streets with asphalt, at a cost not to exceed $250,000.

Rushville, Ill.—The Business Men's Association has petitioned the mayor and council to pave the public square.

Canton, O.—(Special.)—The city council is considering the question of paving Mahoning and Lawrence-aves. with brick.

San Francisco, Cal.—Bitumen paving is contemplated for Valencia-st., from Thirteenth to Twenty-eighth-st.

Urbana, Ill.—The question of paving N. Race-st., from Main-st. to the Wabash R. R. tracks, is being agitated.

Woodbury, N. J.—A committee has been appointed to prepare plans for a road through Harrison and South Harrison townships. William M. Carter, engr.

Minneapolis, Minn.—Resolutions have been passed for improving sundry streets and building stone sidewalks. L. A. Lydiard, cy. clk.

Richmond, Va.—Street improvements, consisting of granite paving, granite curbing, etc., are contemplated. Col. W. E. Cutshaw, cy. engr.

New Castle, Ind.—The town council passed an ordinance, March 28, providing for ten blocks of brick paving in the business center.

Tacoma, Wash.—Paving is contemplated for C-st., from S. Sixth to Jefferson-ave. The council will be asked to pave it with fir blocks.

Nappanee, Ind.—The city clerk has been instructed to receive bids for paving Main and Market-sts. J. F. Freese, prest. town bd.

Orrville, O.—The plans and specifications prepared by Philip Markley of Wooster for paving one of the main streets have been adopted.

Grand Rapids, Mich.—A resolution was introduced in the council, March 8, declaring the paving of Canal-st., from Lyon to E. Bridge, a necessity.

St. Paul, Minn.—The question of paving Minnesota-st., from Second to Summit, and repaving E. Seventh, from the bridge to Hope-st., is being considered.

Wheeling, W. Va.—The construction of at least one block of asphalt over the brick pavement is contemplated as an experiment in the Seventh ward.

Cleveland, O.—Plans have been adopted for the extension of the proposed Lakewood Boulevard, north of Detroit-st., from Highland-ave. to Clifton Park, Rocky River.

Middletown, Conn.—Plans and estimates for macadamizing the streets have been introduced in the council by the street commissioner; estimated cost, $83,000.

Seelyville, Ind.—The citizens desire the incorporation of this village, so that street improvements, better police protection, etc., may be secured.

Lynn, Mass.—Plans have been submitted to the Metropolitan park commission, Boston, by Olmstead Bros., for the proposed boulevard between Lyons and Swampscott.

Boston, Mass.—Mayor Quincy is in favor of constructing a subway from Scollay-square to the Haward bridge, under Beacon Hill, at an estimated cost of $2,502,500.

Moberly, Mo.—Bids will probably be asked in April for 4,266 sq. yds. of double course brick pavement with 3,220 feet of brick curb. H. V. Estell, cy. engr.

Chicago, Ill.—The board of local improvement ordered asphalt, brick, macadam, granite and cedar block pavement and cement sidewalks in a large number of streets, March 22.

Cambridge, O.—Resolutions have been passed for paving five streets, aggregating about 18,000 square yards, with vitrified block. Bids will probably be asked about June 1. O. M. Hoge, cy. engr.

Kewanee, Ill.—Contracts will be let after the city election, which is early in May, for paving the entire business district with brick on a 6-inch concrete foundation. John C. Quade, cy. engr.

Baltimore, Md.—The board of public improvements approved ordinances, March 22, to repave Washington-st., from North-ave. to Clifton Park, and St. Paul-st., from North-ave. to Thirtieth-st.

San Antonio, Tex.—The repaving of San Pedro-ave., from Main-ave. to the San Pedro Springs, including the macadamizing of the avenue, from Warren-st. to the Springs Park, is contemplated.

Mt. Vernon, N. Y.—The aldermen decided, March 21, to macadamize Fourth, Fifth, Sixth and Washington-sts. and Mt. Vernon-ave., from the Harlem R. R. station to the Bronx river.

Belleville, N. J.—The residents of this place and Franklin have prepared a petition

to present to the Park Commissioners asking for a boulevard along the west bank of the Passaic river.

Winnipeg, Man.—H. N. Ruttan, cy. engr., estimates that from six to eight miles of macadam and two miles of block paving will be constructed this year, in addition to asphalt paving.

Ft. Wayne, Ind.—Brick, sheet asphalt and block asphalt paving has been decided upon for numerous streets, and contracts will probably be let in May for the work. Cy. Engr. Randall.

Elkhart, Ind.—A recent vote of council on the question of paving was favorable to asphalt, although nothing of a more definite character was decided upon toward making such an improvement.

Nashville, Tenn.—The construction of about 5,000 sq. yds. of asphalt paving, as an experiment, is recommended by the city engineer. Public-square will be paved with brick; estimated cost, $20,000.

Greenville, Miss.—Paving is contemplated for Washington and Walnut-sts., estimates having been made on brick at $30,000, and chert at $25,000. The question of issuing bonds will be voted on April 4.

Carrollton, Mo.—(Special.)—Hiram Phillips, C. E., St. Louis, Mo., has been employed to draw plans and specifications for street paving, sewers, etc. Bonds for $50,000 have been voted and sold.

Norfolk, Va.—City Engineer Brooke's plan for opening Tripoli-st., from City Hall-ave. to Charlotte, has been adopted. He places the cost for paving the street with brick on concrete, curbing, sewer, etc., at $14,374.

Scottsburg, Ind.—Surveyors and viewers began the work of preparing plans and specifications for building improved roads in Lexington and Jennings townships, March 21. About twenty miles is proposed for Lexington and fifteen miles for Jennings township.

Chicago, Ill.—The amount of paving contemplated this year involves an expenditure of more than $10,000,000 as follows: Asphalt, 35 per cent.; brick, 25 per cent.; macadam, 10 per cent.; granite, 10 per cent.; cedar blocks, 20 per cent.

Syracuse, N. Y.—Plans and specifications are being prepared for paving E. Genesee-st., from S. Warren to S. State, with asphalt, asphaltina, brick or sandstone. Intention has been declared of paving S. Warren-st., from E. Washington to E. Onondaga, with asphalt or asphaltina.

East St. Louis, Ill.—(Special.)—W. J. Crocker, assistant city engineer, says Missouri-ave. will be paved with vitrified brick this spring; length, about two miles; width of roadway, forty-eight feet. About one-half of it will be sewered with vitrified clay pipe.

Butte, Mont.—Resolutions were adopted, March 8, for paving in ten improvement districts. The resolutions called for granite block paving, but property owners in some of the districts prefer vitrified brick. Mayor Harrington says, however, that the character of the pavement can be changed.

Irvington, Ind.—The town board passed an ordinance, March 28, for a cement sidewalk in Lowell-ave., north side, from Hawthorne Lane to Arlington-ave., and a stone screening walk, from Arlington-ave. to Maple, on south side of Lowell-ave., thence east in Maple to Washington. The walks aggregate one mile.

Marion, Ind.—Brick paving is proposed for S. Boots-st., from Fourteenth to Thirtieth, and Delphi-ave., from Third-st. to Butler-ave. The question of paving the entire length of Washington-st. is again being agitated. Brick or asphalt paving has been agitated for this street for several years.

Indianapolis, Ind.—The board of public works has not made arrangements for public improvements of a specific character as yet, but it is thought that the aggregate sum to be expended will not exceed $500,000. Pennsylvania and Illinois-sts. will be resurfaced with asphalt, from Washington to Ohio.

Minneapolis, Minn.—The council paving committee has decided upon paving as follows: Central-ave., from Fourth to Seventh, sandstone with cement filler; Plymouth-ave., from Washington-ave. to Sixth-st., sandstone with sand filler; Western-ave., from R. R. tracks to Lyndale-ave., brick with sand filler; Fifth-ave., south, from Washington-ave. to Third-st., brick with sand filler.

Geneva, N. Y.—(Special.)—E. Seybolt, superintendent board of public works, says this city contemplates constructing about 18,000 sq. yds. of paving this season. Bids have been received for the work, the lowest being submitted by an asphalt firm, but the property owners on the street to be paved are divided on the question of material. Both brick and asphalt have strong advocates. The first brick paving in this city to amount to anything was about 40,000 sq. yds., which was laid last year.

Newark, N. J.—Notice of intention has been published for sheet asphalt paving on concrete on the following streets: Green-st., Broad to New Jersey Railroad-ave.; Burnet-st., Central-ave. to Orange-st.; Hunterdon-st., Fifteenth-ave. to Warren-st.; Fairmount-ave., Fifteenth-ave. to Central-ave.; Quitman-st., Clinton-ave. to W. Kinney-st.; S. Eleventh-st., S. Orange-ave. to Orange-st.; S. Thirteenth-st., Central-ave. to Warren-st.; N. Sixth-st, Warren to Orange; Astor-st., Avenue C to New Jersey Railroad-ave. Jackson-st., from Lafayette to Market, will be paved with asphalt on concrete, and from Lafayette to Ferry, with oblong granite blocks. Other streets to be paved with oblong granite blocks are: Avenue C, Hiller to Parkhurst-st.; College-place, High to Broome-st.; Washington-st., Market to Spruce. Jeliff-ave., New-st. and Peshine-ave. will be curbed and flagged.

CONTRACTS TO BE LET.

Youngstown, O.—Bids are asked until April 8 for laying sidewalks and crosswalks. H. W. Calvin, clk.

Kokomo, Ind.—Bids are asked until April 10 for paving sundry streets with brick. Charles R. Ford, cy. clk.

Watertown, Wis.—Bids will be asked about April 15 for brick paving. G. H Stanchfield, cy. engr.

Lees Summit, Mo.—Bids are asked until April 15 for macadamizing a part of Third-st. A. C. Miller, cy. clk.

South Bend, Ind.—Bids are invited until April 10 for paving sundry streets with brick. L. A. Hull, cy. clk.

St. Louis, Mo.—Bids are invited until April 7 for improving twenty-five alleys. Robert E. McMath, prest. B. P. I.

Schenectady, N. Y.—Bids are asked until April 11 for paving Clinton and upper State-sts. with brick. Cy. coun.

Marion, Ind.—Sealed proposals will be received until April 4 for improving three alleys. Cyrus G. Robbins, cy. clk.

Humboldt, Ia.—Bids are asked until April 4 for grading and graveling roads for the year. Harwood Sharp, co. audt.

Toledo, O.—Bids are asked until April 17 for paving Broadway with vitrified brick on concrete. William A. Holst, cy. clk.

Union City, Pa.—Sealed proposals will be received until April 3 for paving Main-st. with brick. J. E. Gillett, secy. borough.

Trenton, N. J.—Bids are asked until April 5 for macadamizing Asylum and Ferry roads Josiah Jones, dir. bd. chosen freeholders.

Salem, O.—Bids are asked until April 12 for paving seven streets with brick and two streets with asphalt. George Holmes, cy. clk.

Crawfordsville, Ind.—Bids are asked until April 10 for constructing about 30,000 sq. ft. of cement sidewalks. F. Hoffman, cy. engr.

Cincinnati, O.—Bids are asked until April 8 for crushed stone on the approaches of the California bridge. E. L. Lewis, co. audt.

Greensburg, Ind.—Bids are asked until April 7 for building a hard-burned brick, cement or cut stone sidewalk. William Brazleton, cy. clk.

Marinette, Wis.—Bids are asked until April 7 for cedar block paving, grading and stone retaining wall. Harry McCalhoun, cy. engr.

Sharpsburg, Ky.—Bids are asked until April 8 for repairing a number of roads. C. S. Ratliff, comr. of turnpike and gravel roads.

Remington, Ind.—Bids are asked until April 10 for grading, guttering and macadamizing in Ohio and Railroad-sts. Ira W. Yeoman, town clk.

Ukiah, Cal.—Bids are asked until April 9 for constructing a county road between Orr's Springs and Half Way House. Hale McCowen, clk.

Portland, Ind.—Bids will be received until April 17 for constructing about 25,000 sq. yds. of brick pavement. A. J. Frost, cy. engr.

Morristown, N. J.—Bids will be received until April 10 for macadamizing a section of road in Rockaway and Hanover townships. Merritt B. Lum, dir.

Bedford, Ind.—Bids are asked until April 10 for constructing 49,138 feet of gravel or macadamized roads in Perry township. John M. Gainey, co. audt.

Winnipeg, Man.—Sealed tenders will be received until April 5 for the supply of 330 tons of asphalt and six dump wagons. Col. H. N. Ruttan, cy. engr.

Rising Sun, Ind.—Bids are asked until April 17 for building free gravel roads and macadamized roads in Randolph and Cass townships. Robert C. Nelson, co. audt.

Cincinnati, O.—Bids are asked until April 28 for building about 12,500 lin. ft. of macadamized roadway. August Herrmann, prest. bd. trustees, w. w. comrs.

Bedford, Ind.—Bids are readvertised until April 8 for seventeen blocks of brick paving with 6-ft. stone sidewalk, stone curbing, etc. W. M. Denniston, cy. clk.

Boston, Mass.—Bids are desired until April 3 for paving the roadway of the bridge on Summer-st. extension across Ft. Point channel. William Jackson, cy. engr.

Lafayette, Ind.—Bids are asked until April 10 for paving with sheet asphalt or asphalt block and stone curbing, Sixth, Columbia and South-sts. James K. Risk, cy. clk.

Des Moines, Ia.—Bids are asked until April 10 for paving several alleys and streets with brick, with Portland cement curbing. G. A. Eberhart, chrmn. B. P. W.

Glenwood Springs, Col.—Bids are asked until April 3 for road work throughout the eight road districts of Garfield county, for six months, from May 1. C. J. S. Hoover, co. clk.

Albany, N. Y.—Bids are asked until April 3 for paving Howard and William-sts. with brick and granite blocks and for laying a vitrified pipe sewer. Thomas J. Lanahan, clk. bd. contract.

Huntington, Ind.—Bids are asked until April 11 for grading, curbing, paving and constructing sidewalks, catch basins and appurtenances on Tipton-st., from Lafontaine to First-st. Frank Guthrie, cy. engr.

Akron, O.—Bids will be received until April 15 for paving with brick, curbing with stone and guttering Crosby-st., from Maple to Hall, and Maple-st., from Bittman to Bare. Charles H. Isbell, cy. clk.

Crown Point, Ind.—Bids are asked until April 13 for constructing free gravel roads as follows: Ross township, 22 miles; Center township, 3.28 miles; St. John's and Center townships, about 42 miles. Michael Grimmer, co. audt.

Duluth, Minn.—Bids are asked until April 17 for furnishing natural cement, Portland cement and broken stone for constructing a concrete superstructure to breakwater at Marquette, Mich. Clinton B. Sears, mayor engrs.

Pittsburg Landing, Tenn.—Sealed proposals will be received until April 6 for furnishing 1,264 pieces dimension stone, either sandstone or limestone, for head walls to road culverts. Cornelius Cadle, chrmn. Shiloh Battlefield Com'n.

Paterson, N. J.—Bids are asked until April 3 (change of date), for paving as follows: Asphalt—Mill, Washington, Church and Ellison-sts. Brick—Broadway, Van Houten, Prospect, Paterson and Grand-sts. Thomas McLean, city st. comr.

Bridgeport, O.—(Special.)—Sealed proposals will be received until April 17 for paving the streets of this village with brick or asphalt. The specifications consist of five separate forms—paving with brick, furnishing brick, curbing, paving with asphalt and for piling; vil. clk. Hoge, Hix & Hearne, engrs., Wheeling, W. Va.

Boston, Mass.—Bids are asked until April 4 for excavating soil from section 4 of the Wachusett reservoir and excavating and refilling at the easterly portion of the North Dike at Clinton, Mass.; for two contracts for surfacing Boylston-st., in Clinton and Boylston with broken stone. Henry H. Sprague, chrmn. Met. Water Bd.

Waukesha, Wis.—Sealed proposals will be received until April 14 for brick paving on

concrete base, with hard limestone curbing, in the 2nd, 3rd, 4th and 6th wards as follows: Madison-st., from North-st. to Fox river; Broadway, from Fox river to Barstow-st.; South-st., from Broadway to Clinton; Clinton-st., from Wisconsin-ave. to Broadway. John P. Dey, B. P. W.

CONTRACTS AWARDED.

Fargo, N. D.—The contract for paving one of the new paving districts was awarded to James Kennedy for about $38,000.

Woodbury, N. J.—The contract for building a new macadam road was awarded, March 11, to J. F. Shanley of Philadelphia for $6,500.

Boston, Mass.—Bell & Co. of this city secured the contract, March 6, for constructing the Blue Hills Parkway, for $69,221.

Sandusky, O.—The contract for paving Central-ave. and Jackson-st. has been awarded to the Ayres Asphalt Paving company of Zanesville, O.

Kokomo, Ind.—The contract for paving Washington-st. with block has been awarded to Yeager & Dickerson, Danville, Ill., for $20,049.

Peoria, Ill.—The contract for paving Adams and Elizabeth-sts. with brick has been awarded to the Central Construction company, according to press reports.

Windfall, Ind.—A contract was awarded, March 14, to Minich, Gaddes & Dingle of New Castle for constructing brick paving in this city for $16,000.

Oshkosh, Wis.—The lowest bid submitted for grading, curbing and macadamizing Jackson-st. from New York-ave. to Murdock-st., was that of Abrams & Phelan.

Topeka, Kas.—The contract for paving N. Jackson-st. with brick was awarded to H. I. Cook at $1.14 9-10 a sq. yd; curbing, P. H. Gill, 55 cts. a lin. ft.

Franklinville, Pa.—The contract for building a gravel road from this town to the Cumberland county line has been awarded to Quillian & Leary of South Amboy, N. J.

Bloomington, Ill.—Paving contracts have been awarded John Cheney, jr., as follows: E. Washington-st., Tonwanda-ave. and State-st., $15,375; Center-st., from Jefferson to Monroe, $1,417.

South Haven, Mich.—Bids were received, March 20, for brick paving as follows: B. D. Bartow, Port Huron, $12,064; J. J. Granville, E. Saginaw, $11,865; J. H. Talbot, Detroit, $11,370. Action was deferred.

Canton, Ill.—(Special.)—George W. Chandler, cy. engr., says that M. Heckard & Sons were awarded a contract, March 21, for two blocks of brick paving as follows: Excavation, 17 cts.; curbing, 42 cts.; brick paving, $1.05 a sq. yd.; total, $4,800.

Camden, N. J.—The contracts for $200,000 worth of asphalt paving have been adjusted and withdrawn from court. The work is divided about evenly between the Vulcanite Paving company of Philadelphia and Aaron Ward & Co. of this city.

Lebanon, Ind.—The contract for paving W. Pearl-st. was awarded, March 17, to Porter, Bolen & Adams, at $6.17½ a lin. ft. Indiana repressed brick will be used for the roadway, and Terre Haute No. 1 repressed brick for the sidewalks.

Birmingham, N. Y.—The proposition of the Warren-Scharf Asphalt Paving company for repairing the Court-st. pavement, at $1.20 a sq. yd. of surface removed, using Trinidad Lake asphalt and to guarantee the same for a period of five years, has been accepted.

St. Paul, Minn.—The lowest bids received for asphalt paving were as follows: Washington-st., from Third to Seventh, Hennessey & Cox, $10,595; Cedar-st., from Second to Summit, $32,412; Cedar-st., from Summit to Como, sandstone, Fielding & Shepley, $22,738.

Cleveland, O.—The bid of the Warren-Scharf Asphalt Paving company, for paving Beechwood-st. with asphalt at $1.70 a sq. yd., is regarded as a very reasonaole price. M. F. Bramley bid 23¾ cts. a ft. for paving Chamber-st., from Center to the Big Four tracks, with block stone.

Buffalo, N. Y.—Bids were received for sidewalks, March 22, as follows: Artificial stone sidewalks—Buffalo Marbleithic Paving company, 12 cts. per sup. ft.; E. D. Hoffeler, 11¾ cts. per sq. ft.; Robert Seibert & Co., 11¾ cts. per sq. ft. The bids for natural stone sidewalks were so complicated that they will have to be figured out.

Brooklyn, N. Y.—Contracts were awarded, March 7, as follows: Avenue B, 18,700 sq. yds., macadam paving, 3,702 sq. yds. stone paving and 8,313 lin. ft. curb, Hann & Phillips, $23,891.11; Ocean-ave., 37,370 sq. yds. macadam, 14,319 lin. ft. curb, Hann & Phillips, $55,251.62; Eighty-fourth-st., 5,317 sq. yds. macadam, Borough Construction company, $6,409.13.

New Orleans, La.—Bids were received, March 19, for building a shell road at City Park, the lowest bids being submitted by Joseph A. Craven & Co., at 39¾ cts. a sq. yd., and E. A. Grasser, at 35 cts. a sq. yd. It was decided to hold these two bids until the readvertisement of the bids for the excavation of lakes, which would be two weeks later

Easton, Pa.—Brick paving contracts were awarded, March 9, to M. Miles of this city as follows: E. Washington-st., between Third and Fourth, Porter wire cut brick, $1.93; W. Washington-st., between Twelfth and Thirteenth, $1.93. T. M. Lesher & Son, city, secured the contract for Northampton-st., between Fifth and Sixth, at $2.01 for Porter special lug brick.

Washington, D. C.—The contract for paving B-st. with brick was awarded to Lyons Bros. at the following prices: Removing old rubble, 8 cts. a sq. yd.; laying vitrified brick paving, 98⅞ cts. a sq. yd.; resetting curb, 11 cts. a sq. yd. The other bidders were the Alcatraz Paving company of Philadelphia; Washington Asphalt Block & Tile company, Washington; M. F. Talty, Washington.

Grand Rapids, Mich.—(Special.)—The Ayres Asphalt Paving company, Zanesville, O., was awarded asphalt paving contracts, March 17, as follows: Jefferson-ave., $18,499.27; Ottawa-st., $7,696.45. The other bids received for this work were as follows: R. F. Conway company, Jefferson-ave., $19,489, and Ottawa-st., $8,000; Warren-Scharf Paving company, Jefferson-ave., $20,150, and Ottawa-st., $9,472.

Atchison, Kas.—Thomas Beattie was awarded a contract, March 6, for paving Division-st., from Second to Sixth, with brick, as follows: Grading, 17½ cts. a cu.

yd.; curbing, 35 cts. a lin. ft.; paving, 74 cts. a sq. yd.; cast iron bridge plates, 1½ cts.; catch basins, $10; white oak plank, 35 cts.; brick sidewalk, 5 cts.; total, $6,302. Atchison brick and Portland cement concrete curbing will be used.

Des Moine, Ia.—Bids were received, March 20, for paving sidewalks with cement and brick as follows: Cement sidewalks and drives, J. F. Hanrahan, 12 and 22 cts. a sq. ft.; J. D. McCauley, 13 and 15 cts.; James Maine, 12½ and 18 cts.; Joseph Kehoe, 12 and 36 cts. Brick sidewalks and drives, J. F. Hanrahan, 6 1-5 and 18 cts.; F. W. Hunt, 6¾ and 18 cts.; Y. D. McCauley, 6⅝ and 19 cts; James Maine, 8 and 18 cts.; Joseph Kehoe, 9 9-10 and 21 cts.

Columbus, O.—Bids were received, March 14, for repairing Broad-st., east of Taylor-ave., as follows: N. B. Abbott, Trinidad asphalt, $1.60 a sq. yd., and foundation, 60 cts; W. H Luchtenberg, asphalt, $2, foundation, 60 cts.; A. G. Pugh, asphalt, $1.30, foundation, 58 cts.; W. M. Graham, asphalt, 90 cts., foundation, $1.45. About thirty bids were also filed for improving Wilson-ave., Grant, Atchison and Mulberry-sts., all of which were referred to the city engineer to be tabulated.

Saginaw, Mich.—Bids were received, March 17, for 6,700 sq. yds. of brick and 19,750 sq. yds. of asphalt paving in Court-st., and 1,840 sq. yds. of brick and 3,860 sq. yds. of asphalt in Hamilton-st., as follows: Barber Asphalt Paving company, New York City, brick, $1.55, and asphalt, $1.70; totals, Court-st., $46,846, and Hamilton, $10,085. Alcatraz Construction company, New York City, brick, $1.57, and asphalt, $1.78; totals, Court-st., $49,517, and Hamilton, $10,657. F. E. Cole, Toledo, brick, $1.57, and asphalt, $1.89; totals, Court-st., $50,733, and Hamilton, $10,856.

Joliet, Ill.—(Special.)—The R. F. Conway company of Chicago was awarded asphalt paving contracts, March 20, as follows: Herkimer-st., $19,379; S. Chicago, $27,419.15; Eastern, $29,229.70; N. Chicago, $16,655.70; Cass-st., $11,603; total, $104,386.55. The total bids of the other bidders were: J. Sackley, $109,189.50; Warren-Scharf Asphalt Paving company, $121,014.35; Indiana Bermudez Asphalt Paving company, $124,216.40; Bermudez Asphalt Paving company, $137,128. The bids per square yard, including 6-ins. of concrete and binder, were: R. F. Conway company, $1.50 and $1.51; James A. Sackley, $1.67 and $1.69; Indiana Bermudez Asphalt company, $1.87 and $1.89; Warren-Scharf Asphalt Paving company, $1.70 and $1.75; Bermudez Asphalt Paving company, $1.91 and $1.92.

Chicago, Ill.—Paving contracts have been awarded as follows: Macadamizing Avenues L and M, South Chicago Teaming company; macadamizing Chestnut-st. and paving with cedar blocks Forty-first, Barry and S. Campbell-aves. and Justin and Whiting-sts. and several alleys, R. F. Conway company; asphalt Delaware-place, Western Paving & Supply company; macadamizing Lowe and N. Albany-ave., O. M. Netterstrom; asphalt, Vernon-ave., Schillinger Bros.; granite blocks, W. Twelfth-st., Gaffney & Long; cedar blocks, N. Fortieth-st., and several alleys, Smith, Moss & Brown; macadamizing Princeton-ave., James Conlan company; cedar blocks, several alleys, Sackley & Peterson.

SEWERS.

CONTEMPLATED WORK.

Princeton, Ill.—The construction of a main sewer is urged.

Fairmount, Minn.—A sewerage system is proposed.

Mt. Holly, N. J.—The White-st. sewer will be extended.

Clarksburg, W. Va.—A sewerage system is contemplated.

Neenah, Wis.—The council has decided to build additional sewers.

Sleepeye, Minn.—Plans are being made for a sewerage system.

Goshen, Ind.—The question of sewerage construction is being considered.

Lakewood, O.—A sewerage system is contemplated. V. H. Burke interested.

Guthrie, Okla.—This city has voted to issue $45,000 bonds for a sewerage system.

Highpoint, N. C.—Plans are being made for a sewerage and water works system.

Pulaski, Tenn.—This city has secured permission to build a sewerage system.

Corvallis, Or.—The question of building a sewerage system is being considered.

Sauk Center, Minn.—The construction of a sewer on Main-st. is contemplated.

Bushnell, Ill.—A contract for building a sewerage system will probably be let in June.

St. Paul, Minn.—The council has voted to build the Hamline-st. sewer; estimated cost, $37,000.

Everett, Mass.—The council has voted to issue $25,000 bonds for sewers. C. Harrison, cy. engr.

Paterson, N. J.—A resolution was adopted, March 21, providing for additional sewers in this city.

Washington, D. C.—The district commissioners have ordered sewers constructed in S and P-sts.

Sioux City, Ia.—The construction of storm water sewers, at a cost of $10,000, is contemplated.

Foxboro, Mass.—The plans for a sewerage system have been approved by the state board of health.

Toledo, O.—An ordinance has been passed establishing main sewer district 31 at Air Line Junction.

Baltimore, Md.—An ordinance appropriating $10,000 for a sewer in Lee-st., has been passed.

Westboro, Mass.—The question of securing a better method of sewage disposal is being considered.

Elkhart, Ind.—The council has decided to build two miles of sewers in Riverside and sewers in five streets.

Providence, R. I.—The building of sewers in different sections and in the annexed districts is urged.

Hudson, Wis.—The question of issuing $7,500 bonds for sewerage construction will be voted on April 15.

Harrison, N. J.—Notice of intention has been published for the construction of a sewer in Sussex and Warren-sts.

Auburn, Ind.—Plans have been adopted for

a ten-mile sewerage system: estimated cost, $40,000. Cy. Engr. Van Auken.

Wells, Minn.—The construction of a sewer from the school house grounds to the main sewers is contemplated.

Nappanee, Ind.—The clerk was authorized, March 7, to receive bids for the survey of the town and for building sewers.

Stevens Point, Wis.—The council voted recently to issue $35,000 of bonds for the completion of the sewerage system.

Marion, O.—A sewerage disposal farm and two sewers are contemplated. J. W. Scott, cy. engr.

Seattle, Wash.—Plans have been made for 28,000 lin. ft. of sewers; estimated cost, $52,000. Frank Oleson, secy. B. P. W.

Cambridge, Mass.—This city has been authorized to incur an indebtedness of $400,000 for new sewers. L. M. Hastings, cy. engr.

Woodbridge, Mass.—Plans for a proposed sewerage system have been submitted by Waring, Chapman & Farquhar of New York City.

Hammond, Ind.—Notice of intention has been published for building sewers in Cameron and Gostlin-sts. Frank H. Lyons, cy. clk.

Middleboro, Mass.—Plans are being prepared for a sewage disposal system. Jared F. Alden, John A. Mills, com.

Newburg, N. Y.—The construction of a sewer in North-st. and a system in the West End are contemplated. Cy. Surv. Coldwell.

Passaic, N. J.—The United States Water & Sewage Purifying company has been organized in this city. The company controls the Pridham patents.

Jackson, Miss.—The council has ordered the issue of $100,000 of bonds for a sewerage system, the construction to begin as soon as possible.

Bellefontaine, O.—The question of building a sewerage system at a cost of $30,000 will be voted upon soon. Com'r Lamb.

Walla Walla, Wash.—The Commercial Club will petition the city council to build a new sewerage system; estimated cost, $150,000.

Indianapolis, Ind.—A petition has been presented to the board of public works for a sewer in Northwestern-ave., north of Fall creek.

The Dalles, Or.—The council has decided to build new pipe sewers in the streets below the bluff and in Union-st. above the bluff.

Pembroke, Ont.—Bids will probably be asked in April for the construction of main sewers; estimated cost, $10,000. A. J. Fortier, town clk.

Olneyville, R. I.—The committee on sewers will report favorably on the petitions for sewers in the annexed districts; estimated cost, $21,168

Islip, N. Y.—The question of raising $3,000 by tax for a surface drain 2,000 ft. long, will be voted on April 4. F. S. Whitman, highway comr.

Lead, S. D.—The city council has decided to construct a sewerage system, for which Andrew Rosewater, C E., Omaha, Neb., has prepared plans.

La Crosse, Wis.—The recommendations for the construction of sewers on State, N. Fourteenth and S. Fourth-sts., have been referred.

Omaha, Neb.—Sewers are contemplated for the North Side. Plans for that section of the city have been outlined by Andrew Rosewater, city engineer.

Franklin, Mass.—Joseph G. Ray, J. C. Gallison and George W. Wiggin have been appointed a committee to engage an engineer to prepare plans for a sewerage system.

Columbus, O.—A series of maps and blue prints, covering the territory in the South Side, for which a sewerage system is proposed, have been finished.

Portland, Conn.—The Portland Sewer company has asked for a charter to build a sewerage system in this city. C. A. Sears and Dr. J. A. Webb are interested

Ann Arbor, Mich.—The council voted, March 20, to build storm sewers covering the E. Liberty and Washtenaw-ave. districts, at an estimated cost of $8,000.

Cohoes, N. Y.—The public improvement commission adopted the map and plan of section 3 of the sewerage system, March 17. The commission has adjourned until April 5.

Lynn, Mass.—This city contemplates building a covered conduit for the pond which feeds Stacey Brook, flowing into the ocean; estimated cost, $40,000. Mayor Shepherd.

Lebanon, Pa.—The business men and property owners have petitioned the city council to take immediate action toward inaugurating a system of house sewers.

Chillicothe, O.—Specifications have been submitted by Engineer Redd for the proposed construction of three storm sewers, the estimated cost being $2,100, $3,000 and $3,960 respectively.

Sacramento, Cal.—A bill has been passed authorizing the construction of a new sewerage system at Folsom Prison. The Chamber of Commerce will advance the $15,000 which will be required.

Warren, O.—Plans for a sewage disposal plant for the Trumbull county infirmary, prepared by Barbour & Snow, Boston, Mass., and Columbus, O., have been approved by state board of health.

Williamsport, Pa.—The construction of a 10½-ft. brick sewer, to drain the district around Grafiu's Run, is contemplated, at an estimated cost of $100,000. No action has been taken. G. D. Snyder, cy. engr.

Carrollton, Mo. — (Special.) — Hiram Phillips, M. Am. Soc. C. E. of St Louis, has been employed to draw plans and specifications for a system of sewers and street paving. Bonds for $50,000 have been voted and sold.

New York City.—A bill has been introduced in the legislature providing for a commission to inquire into the expediency of building sewers through the counties of New York and Westchester along Bronx river and Hutchinson river.

Kansas City, Mo.—The extension of the O. K. intercepting sewer 1,200 ft. along the O. K. creek to the Memphis bridge, is suggested by City Engineer Wise; estimated cost, $25,000. Plans have been prepared for sewers in Turkey Creek; estimated cost, $20,000.

Westborough, Mass.—The State Board of Health of Massachusetts has declared necessary for this place additional sewage filter beds. The complaint of the town of Northborough that sewage was being dis-

charged into the Assabet river by this town led the board to investigate.

Brookfield, Mo.—(Special)—Mayor E. E. Ward says this city votes April 4 on the question of $13,500 bonds to construct outlet sewers. This is the second election, the first being held in 1898 and resulting in the question of sewerage carrying, but the bonds were defeated.

New Britain, Conn.—The estimated cost of separating the storm water from the regular sewage, requiring 12 miles of additional sewers, is from $175,000 to $200,000, whichever system is adopted. The cost of constructing a sewer to the Connecticut river would be between $500,000 and $600,000.

Chicago, Ill.—Mayor Harrison urges the need of a drainage channel from Lake Calumet to Sag Bridge in a communication to Thomas Kelly, president of the board of sanitary trustees, and asks the board to unite with the city in seeking the aid of the general government in the construction of the channel.

Newark, N. J.—The joint sewer bill has been passed ,authorizing Vailsburg, Irvington, South Orange, West Orange, Milburn and the western part of this city to jointly construct a trunk or outlet sewer. An ordinance is pending which provides for a main pipe sewer with branch pipe sewers in sundry streets. Wm. Greathead, clk. bd. st. and water comrs.

Indianapolis, Ind.—Plans have been submitted to the Board of Public Works for the construction of an intercepting sewer to receive all the sewage from the territory north of Fall Creek and to discharge it into the White river interceptor. Plans have also been submitted for a large sewer in E. Michigan-st., from Pogue's run to Rural-st. Resolutions have been passed for the following: For the construction of the Fall Creek interceptor, with a branch in Twenty-Third-st.; main sewer with appurtenances and lateral connections in Hillside-ave.; local sewer in Pine-st., with branches in a number of streets. M. A. Downing, chm. B. P. W.

CONTRACTS TO BE LET.

Kokomo, Ind.—Bids are asked until April 10 for building a 12-in. tile sewer. J. W. Ford, cy. clk.

Akron, O.—Bids are asked until April 15 for building 3¾-mis. of trunk sewer. J. W. Payne, cy. engr.

Sandusky, O.—Bids are asked until April 15 for building a branch sewer in Fulton-st. A. W. Miller, cy. clk.

East Liverpool, O.—Bids are desired until April 4 for sewers in sewer dist. No. 2. F. H. Croxall, secy. bd. sewer comrs.

Huntington, Ind.—Bids are asked until April 11 for constructing catch basins and appurtenances. Frank Guthrie, Cy. S. E.

Toledo, O.—Bids will be received until April 3 for building cylindrical pipe sewers in several alleys. Wm. O. Holst, cy. clk.

Plainfield, N. J.—Bids are asked until April 3 for building pipe sewers, branches, connections, etc. J. T. MacMurray, cy. clk.

Whiting, Ind.—Bids will be received until April 3 for building 2½ mis. of vitrified pipe sewer and 1 mi. of brick sewer. John Erdlitz, town clk.

Cincinnati, O.—Bids are asked until April 28 for constructing 9,000 ft. of sewer pipe drains. Aug. Herrman, prest. bd. trustees, comrs. of w. w.

Des Moines, Ia.—Bids are asked until April 10 for building 257 lin. ft., more or less, of 12-in. vitrified clay pipe sewer. E. G. A. Eberhart, prest. B. P. W.

Wapakoneta, O.—The contract for widening and deepening Gracely ditch, commonly known as Prairie creek, will be sold at public outcry April 15. Samuel Craig, engr.

San Carlos, Ariz.—Bids are asked until April 18 for building a sewer and water works system at the San Carlos agency. W. A. Jones, comr. Indian Affairs, Washington, D. C.

New London, Conn.—Bids will be received until April 6 for furnishing and laying about 5,000 ft. of 8-24-in. salt glazed, vitrified sewer pipe; also, for constructing 700 ft. of 24-in. submerged sewer. W. H. Richards, engr.

New Orleans, La.—Bids wil be received until April 20 for dredging the main out-fall canal, which connects the Florida walk canal at Jourdan-ave. Pumping Station No. 5 with Bayou Bienvenue. A Schreiber, secy. Drainage Com'n.

Pittsburg Landing, Tenn.—Bids will be received until April 6 for furnishing 800 ft. 12-in., 385 ft. 18-in., 490 ft. 24-in. double strength culvert pipe, and 100 bbls. Louisville cement. Cornelius Cadle, chrmn. Shiloh Battlefield Com'n.

Independence, Mo.—(Special.)—Bids are asked until April 14 for constructing public sewers consisting of 709 ft. 18-in., 5,682 ft. 15-in., 3,940 ft. 12-in., 8,171 ft. 10-in. and 18,620 ft. 8-in. pipe. H. H. Pendleton, cy. engr.

Honolulu, H. I.—Bids will be received until April 15 for Portland cement, brick, sewer pipe, pumping machinery, etc. necessary in the construction of a sewer. Rudolph Hering, engr., 100 William-st., New York City.

Chicago, Ill.—Bids are asked until April 18 for constructing foundation for seven arch culverts, and nine pipe culverts under the feeder, Illinois and Mississippi canal, and for other work of the same character. W. L. Marshall, maj.-engrs.

CONTRACTS AWARDED.

Atlanta, Ga.—The contract for building sewers was awarded, March 17, to David Smith for $23,274.

Boone, Ia.—The contract for building 165-ft. of sewerage has been awarded to Wm. Palmer for $1,500.

Bloomington, Ill.—The contract for building the Valley sewer was awarded, March 23, to John Cheney for $12,725.

Cincinnati, O.—The contract for building sewers in Stock and Bates avenues was awarded to P. M. Jonte for $72,459.

McKeesport, Pa.—The contract for building a sewer on Irwin-st. has been awarded to Keeling, Ridge & Co. of Pittsburg for $30,492.

Steelton, Pa.—The contract for building the new sewerage system was awarded to Irwin Bros., Greenville, O., for $33,248.34.

Neenah, Wis.—The contract for building a sewer outfall has been awarded to the Hackworthy Construction company for about $1,700.

Cleveland, O.—Bramley & Gribben were awarded the contract, March 15, for the second and third section of the Walrorth Run sewer for $139,450.

Laurium, Mich.—The contract for building

a sewerage system was awarded, March 14, to Thos. J. Peter, Terre Haute, Ind., for $30,822.

Norfolk, Va.—The contract for building a sewerage system in the Brambleton road was awarded to Guild & Co. of Chattanooga, Tenn., for $66,330.

Niles, O.—(Special.)—Wm. Wilson, cy. engr., says the contract for building the Robbins-ave. sewer was awarded, March 7, to C. R. & S. H. DeGroodt of Youngstown, O., for $8,858.56.

Buffalo, N. Y.—The lowest bidder on the whole of the Emslie-st. sewer, March 22, was Thos. F. Moore, who bid $72,400 on section 1 and $12,500 on section 2; total, $84,900.

Plainfield, N. J.—The contract for replacing 2,290 ft. of vitrified pipe sewers with iron pipe sewers was awarded, March 13, to C. M. Meeker at $1.03 for 12-in., 96 cts. for 10-in., 45 cts. for 4-in. sewers and 53 cts. for 15-in. underdrain.

St. Paul, Minn.—Sewer contracts have been awarded as follows: Robie-st., from Bidwell to Bellow, P. J. Ryan, $795; E. Fourth-st., from Mendota to Forest, Anderson & Johnson, $562. Bids were received March 23 for a sewer in Atwater-st., from Rice to Sylvan, as follows: Peter Peterson, $1,447; Andrew Mortensen, $1,312; Patrick Doherty, $1,267; John Lindquist, $1,295; P. J. Ryan, $1,540; Nicholas Feyen, $1,343; Anderson & Johnson, $1,296.

WATER-WORKS.

Delaware, O.—Municipal ownership of the water works is proposed.

Sacramento, Cal.—A small plant for sand filtration is being built at the city water works as an experiment.

Grayville, Ill.—The question of purchasing the Grayville water works at a cost not to exceed $26,000 will be voted on in April. T. F. Hoover, clk.

Chicago, Ill.—The water supply is reported as being greatly improved by the partial diversion of sewage from the lake through one of the new intercepting sewers.

Pittsburg, Pa.—The Pennsylvania Water company of this city has absorbed the East Pittsburg Water company, which supplies water to the towns of the Turtle Creek valley.

Worcester, Mass.—Damages for water rights have been awarded against the city in favor of mill owners, to the amount of $508,395, on account of the city taking the waters of Kettle brook for its water supply.

Fowler, Ind.—A bill was filed in the Federal court at Indianapolis, March 28, for a receiver for the Fowler water works, alleging default of payments on the bonds and the general insolvency of the company.

Newark, N. J.—During the first three weeks of March 196 cases of typhoid fever were reported. The cause is said to be the pumping of water from the Passaic river at Belleville during the extremely cold weather.

New Incorporations: Duquoin Water Works company, East St. Louis, Ill.; Albany Water and Light company, Albany, Ind.; Houston Water company, Houston, Tex.; Massena Water company, Massena, N. Y.; Tupper Lake Water company, Tupper Lake, N. Y.

St. Joseph, Mo.—A popular vote recently resulted in a ratification of a franchise granted in January to R. E. Culver and others, and of a contract for hydrant rental. The contract was awarded to the Seckner Contracting company of Chicago.

Trenton, N. J.—The supreme court rendered a decision March 14 denying the application of certain tax-payers for a writ of certiorari to review the award, by the street and water board of Jersey City, of a contract to Patrick H. Flynn for supplying that city with water.

CONTEMPLATED WORK.

Mt. Clemens, Mich.—The question of a pure water supply is being agitated.

Claremont, N. H.—Municipal ownership of water works is contemplated.

Sleepeye, Minn.—Plans have been prepared for a water works system.

Ballston Spa, N. Y.—The question of securing a standpipe is being considered.

Altoona, Pa.—Ordinances have been passed to lay water drains in several streets.

Pearl City, Ill.—The improvement of the water works system is contemplated.

Bluehill, Me.—This town is considering a plan for acquiring municipal water works.

Salem, Mass.—An appropriation has been voted to replace cement-lined pipe with iron pipe.

Pascoag, R. I.—A company has been organized to build water works, according to press reports.

Mason City, Ia.—The water works system of this city is inadequate and will have to be enlarged.

LaSalle, Ill.—A plan has been prepared for making the water works system of this city reliable.

Leadville, Colo.—The question of municipal ownership of the water works will be voted on April 4.

Enfield, Mass.—A committee has been appointed to investigate the question of a water supply.

Phoenixville, Pa.—A filter plant and an additional reservoir have been recommended to improve the water supply.

Napoleonville, La.—Bids are desired, according to press reports, for building water works. L. P. Herbert, mayor.

Pottsville, Pa.—The present reservoir at the almshouse will be replaced with one of 8,000,000 gallons capacity.

New Brunswick, N. J.—The purchase of a new pump of 6,000,000 gallons capacity has been decided upon. F. A. Hoffman, supt. w. w.

Bloomfield, Ind.—The town trustees have employed an engineer to survey for a combined water works and electric plant.

Sacramento, Cal.—The question of issuing bonds for water works and sewerage extension will be voted upon in a few months.

Sioux Falls, S. D.—The question of issuing $130,000 bonds for the construction or purchase of water works will be voted upon on April 4.

Plymouth, N. H.—This town has voted to purchase at $35,000 and rebuild the water system of the Plymouth aqueduct and water company.

Memphis, Tenn.—The artesian water company has refused this city's offer to purchase the plant. Vice-Mayor Haddon favors building a new plant.

San Luis Obispo, Cal.—The city trustees are considering an ordinance for issuing bonds for the improvement of the water works system.

Chicago, Ill.—An appropriation of $200,000 has been made for building a water tunnel from the new Carter H. Harrison crib to the Chicago-ave. crib.

Authority to build water works has been granted the following towns: Louisburg, N. C.; Medway, Mass.; Lincolnton, N. C.; Salisbury, N. C.; Durand, Mich

Pittsburg, Pa.—The finance committee of the councils has approved the report of the filtration commission, which recommended a bond issue of $3,000,000 for constructing and operating a filtering plant.

The question of issuing bonds for water works construction will be voted on as follows: Linton, Ind.; Blooming Prairie, Minn., April 4; Gothenburg, Neb.; Elk Point, S. D., April 3; Pomeroy, Ia., April 10; Tarboro, N. C., April 17; Rocky Mount, N C

The question of water works has been favorably voted on as follows: Oregon, Wis., Oconomowoc, Wis.; Walker, Minn.; Wykoff, Minn.; Frazee, Minn.; Laurel, Del.; Reidsville, N. C.; Morton, Minn.; Tyler, Minn.; Seaford, Del.; Avondale, Ala.

Salt Lake City, Utah.—In his report on the water supipy, F. C. Kelsey, cy. engr., estimates the cost of a 5,000,000-gal. reservoir at $28,553; proposed changes and improvement in water pipe system, $18,758; proposed changes in City Creek water main, $19,558.

The construction of water works is contemplated at the following places: Correll, Minn.; Lakefield, Minn.; Kenny, Ill.; Milford, Ind.; St. Mary's, Ont.; Appleton, Minn.; Mt. Gilead, O.; Nora Springs, Ia.; Hanover, Mass.; Bastrop, La.; Garwin, Ia.; Lakefield, Minn.; Gibbon, Minn.; Claremont, Minn.; Hume, N. Y.; Allen, Neb.; North Bend, Neb.

CONTRACTS TO BE LET

Freeport N. Y.—Bids are asked until April 15 for constructing water works.

Austin, Minn.—Bids are asked until April 7 for furnishing 20-in. water pipe. W. M. Todd, supt.

Mankato, Kas.—Bids are asked until April 8 for building water works. J. B. Dill, cy. clk.

Baird, Tex.—Bids are desired until April 3 for a water works system. Arthur Yonge, mayor.

Mayville, N. D.—Bids are asked until April 5 for building water works. Samuel Torgesson, cy. audt.

Yonkers, N. Y.—Bids are asked until April 6 for water pipe. John C. Shotts, prest. bd. water comrs.

Elizabethtown, Ky.—Bids will be received until April 5 for erecting a stand pipe. R. L. Wintersmith, mayor.

Finley Park, Ill.—Bids are asked until 15 for building a water works system. Walter E. Butler, cy. clk.

Montgomery, Ala.—Bids are asked until April 15 for constructing a 5,000,000 gal. pumping engine. R. H. Sommerville, treas.

Lakeport, Cal.—Bids are asked until April 17 for building water works, pumping plant, reservoir, etc. H. V. Keeling, town clk.

Albany, N. Y.—Bids are asked until April 4 for new water mains on Howard and Willam-sts. Geo. J. Bailey, supt. bd. water comrs.

Newport, Ky.—Bids are asked until April 5 for furnishing a 300-H. P. water tube boiler for the water works. Geo. Henning, supt.

Berea, O.—Bids are asked until April 4 for constructing a stand pipe and laying 570 tons of cast iron water pipe. T. J. Quayle, mayor.

Ontario, Cal.—Eids will be received until April 8 for constructing an extension to the Rodenhagen tunnel. W. T. Leeke, prest. San Antcnio Water company.

San Carlos, Ariz.—Eids are asked until April 18 for a water works system at the San Carlos Agency. W. A. Jones, comr. Indian Affairs, Washington, D. C.

Newark, N. J.—A motion was adopted, March 28, to instruct City Engineer Sherrerd to advertise for bids for driven wells, the bids to be opened April 4.

Boston, Mass.—Bids are asked until April 4 for laying cast iron water pipe in city of Medford and town of Arlingtcn. Henry H. Sprague, chrmn. Met. Water Bd.

Cincinnati, O.—Bids are asked until April 28 for building three reservoirs at California and laying pipe to the top of the hill from the river. G. Bouscaren, ch. engr.

Philadelphia, Pa.—Bids are asked until April 11 for two pumping engines for Roxborough station, pump chambers and valves for engines Nos. 2 and 3. Spring Garden Station. Thos. M. Thompson, Dir.

Seattle, Wash.—Bids are asked until April 12 for constructing and completing certain additions to the existing water works system. The contract will be let in four separate subdivisions. Frank Oleson, B. P. W.

Butte, Mont.—Bids are asked until April 19, change of date, for completing a pipe line as follows: 50,000 lin. ft. 24-in. banded stave pipe, 16,000 lin. ft. 26-in. riveted steel pipe with gate valve, special castings, etc. Eugene Carroll, ch. engr.

CONTRACTS AWARDED.

Kirksville, Mo.—The contract for building the water works filter was awarded to W. H. Miller.

Scio, O.—The contract to build the water works system has been sublet to M. A. Castor of Bellaire

Whitehall, Ill.—The contract for putting in water works was awarded to the Whitehall Electric company for $28,005.

Blockton, Ia.—The contract for building a water works system was awarded to Jackson & Moss of Des Moines for $3,500.

Brownstown, Ind.—The contract for building a water works and electric light plant has been awarded to the Phoenix Construction company for $26,000.

Shiner, Tex.—The city council granted a franchise, March 10, to Charles Wilhausen, M. E. Wolter, C. L. Williams and J. C. Blohen for building and operating a water works system

Keshena, Wis.—The contract for building a water works system at the Menomonie schools on the Keshena Indian reservation was awarded to the Sanitary Construction company of Green Bay, Wis., for $10,000

BRIDGES.

Carlton, N. Y.—This town voted March 14 to build a bridge at Waterport.

Richmond, Ind.—Petitions have been received for building six bridges.

Iowa City, Ia.—Bids are asked until April 7 for building bridges. Co. audt.

Denison, Tex.—Plans have been prepared for a steel bridge to replace the present bridge over Katy Shops.

Providence, Tenn.—The question of building a bridge across Tradewater river is being agitated.

Goldbeach, Ore.—Bids are asked until April 5 for a bridge over Elk river. C. V. Woodruff, co. clk.

Clinton, Ind.—The county commissioners have decided to build a new bridge over the Wabash river.

Morgan, Ky.—The old wooden bridge is in a dangerous condition and a new iron bridge is suggested to replace it.

Bayonne, N. J.—A bridge is considered necessary across the tracks of the Central R. R. at Thirtieth-st.

Kent, Ill.—The contract for building two bridges was awarded to the Wrought Iron Bridge company of Canton, O., for $1,000.

Mitchell, S. D.—Bids are asked until April 3 for building a steel bridge across James river. H. B. Anderson co. audt.

Raleigh, N. C.—Bids are asked until April 23 for a steel bridge over the river at the Falls of Neuse. Co. suprs.

Natchez, Miss.—Bids are asked until April 3 for building two steel bridges. J. F. Jenkins, chancery clk.

Waterford, N. Y.—A bill, appropriating $3,000 for an iron bride over the canal, has passed the assembly.

Malden, Mass.—The construction of an iron bridge over the tracks of the Boston & Maine railroad at Washington-st. is contemplated.

Defiance, O.—Plans have been adopted by the city council for a new steel bridge over the railroad track on Ralston-ave.

Sidney, O.—Bids are asked until April 4 for material, plans, etc., for building a Pratt truss bridge. J. S. Laughlin, co. audt.

Batavia, O.—Bids will be received until April 12 for building a steel bridge across Big Indian creek. John W. Davis, co. audt.

Goffstown, N. H.—An appropriation has been made for a steel bridge, to replace the present wooden bridge across the Piscataquog river.

Cleveland, O.—Bids are asked until April 7 for building a steel and iron bridge at Center-st. across the Cuyahoga river. Geo. R. Warden, dir.

Milwaukee, Wis.—Plans have been completed for a new folding bridge at the foot of Broadway, but no appropriation for the work has been made.

Hamilton, O.—The engineers of this city and Dearborn, Ind. have been directed to prepare plans for repairing the Whitewater river bridge at Harrison.

St. Louis, Mo.—A resolution has been passed directing the street commissioner to prepare plans for a steel bridge over the Terminal railroad tracks at Ewing-ave.

Kansas City, Mo.—City Engineer Wise has approved plans for a steel bridge across the tracks of the Belt Line railway at Woodlawn-ave. Estimated cost, $4,000.

Columbus, O.—Bids are asked until April 8 for building bridges over Big Walnut creek and Hill Branch, and until April 12 for four bridges. W. H. Halliday, co. audt.

Hartford, Conn.—Bids are asked until April 15 for a new bridge on Hartford-ave. in East Hartford. Bids will be asked on two plans. Conn. River Bridge and Highway Dist. Comn.

Vandergrift, Pa.—The commissioners of Westmoreland and Armstrong counties contemplate building a bridge across Kiskiminetas river at this city; estimated cost, $30,000.

Macon, Ga.—(Special.)—H. D. Cutter, C. E., says twenty bids were received March 14 for building a two-span bridge over Ocmulgee river, on Fifth-st., but no bid has been accepted yet.

New York City—The board of estimate has authorized a bond issue of $644,495.63 for a bridge over Newton creek, from Manhattan-ave., Borough of Brooklyn, to Vernon-ave., Borough of Queens.

Rochester, N. Y.—Sealed proposals will be received until April 15 for building a steel highway bridge over the track of the B., R. & P. Ry. Co. at Gainesville, N. Y. W. E. Hoyt, ch. engr. B., R. P. Ry. Co.

Binghamton, N Y.—(Special.)—H. Ward says the vote for buildinig a bridge over the Susquehanna at Tompkins-st. was in the affirmative. The bridge will be about 450 ft. long and will cost about $40,000.

St. Paul, Minn.—Preliminary drawings for rebuilding the south end of the Wabasha-st. bridge have been submitted to the city council and work will begin as soon as plans and specifications can be approved and contracts let.

Shelbyville, Tenn.—The construction of steel bridges over Duck river and tributaries at Hall's Mill, Simon's Ford, Normandy and east of Wartrace over Garrison Ford, will be recommended at the April term of the county court. T. F. Smalling, J. D. Steele, E. L. Cooper, Ken Reagor, W. J. Barnett, com.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Gainesville, Tex.—Efforts are being made by the city to have its streets cleaned.

Canton, O.—The council is reported as considering propositions for street cleaning.

Louisville, Ky.—Bids are asked until April 17 for furnishing a garbage crematory.

Des Moines, Ia.—The question of putting in a new crematory is being considered.

Bennington, Vt.—The question of using a street sweeper on the streets is under consideration.

Memphis, Tenn.—The city council has authorized the construction of two garbage crematories.

Greenville, Miss.—The mayor has been directed to purchase a crematory, according to press reports.

Crawfordsville, Ind.—The question of garbage disposal is being considered. F. Hoffmann, cy. engr.

St. Joseph, Mo.—New plans for cleaning the streets will be put into operation by Street Commissioner Furst.

Racine, Wis.—Plans and specifications have been adopted for sprinkling the various streets during 1899.

Cohoes, N. Y.—The question of securing a garbage disposal plant is being considered. Ald. Clark and Dr. Mott interested.

Braddock, Pa.—The council is desirous of receiving propositions for the construction of a garbage plant by private capital.

Binghamton, N. Y.—A bill has passed au-

thorizing this city to contract for the collection and disposal of garbage.

Allentown, Pa.—The contract for the removal of garbage for two years has been awarded to Barney F. Gallagher at $1,900 a year.

Fall River, Mass.—The contract for the collection of garbage for five years has been awarded to Isaac E. Willetts for $56,500.

St. Louis, Mo.—Bids are asked until April 7 for sprinkling 8¼ miles of streets from May 1 to Dec. 1. E. S. Foster, secy. B. P. 1.

Houston, Tex.—Plans for a garbage disposal plant will be prepared by Alexander Potter, C. E., New York City. J. A. Miller, cy. engr.

Grand Rapids, Mich.—The question of purchasing a street sweeper for the second district has been referred to the committee on streets.

Washington, D. C.—Bids will be received April 10 for sweeping the streets, avenues and alleys. The specifications call for sweeping and cleaning the streets by machinery and hand labor, and to let the contract to the lowest responsible bidder. John B. Wight, chrmn. dist. comm.

Indianapolis, Ind.—Bids were received March 27 for street sprinkling. Under the specifications this year there are sixteen sprinkling districts in the city. The bids were received for 10,000 sq. ft. and proved to be on an average $8 higher than last year, ranging from $25.99 to $37. New bids will be asked for.

PARKS.

Marion, O.—A public park is contemplated. J. J. Beatty cy. clk.

Anderson, Ind.—A park has been established on Main-st., by the Big Four railroad company.

Kansas City, Mo.—The park board has under consideration plans for the proposed park system.

English, Ind.—A tract of land of 320 acres has been offered the town for park purposes.

Richmond, Ind.—The city council has decided to convert Maple Grove cemetery into a public park.

Clinton, Ia.—The establishment of a river park is contemplated by the city council. Chas. P. Chase, cy. engr.

New Orleans, La.—The question of improving Audubon park is being considered by the park commissioners.

Philadelphia, Pa.—The council has awarded the first prize, $750, for plans to lay out League Island park to Samuel Parsons of New York City, and the second, $250, to R. Oelrich of New York City.

Indianapolis, Ind.—Mayor Taggart has appointed as members of the park board, the following: Wm. E. English, four years; Isaac King, two years; Chas. E. Coffin, three years; George Merritt, one year. The board has elected Wm. E. English, president; J. C. Power, engineer and superintendent; Otis C. Hann, clerk.

STREET LIGHTING.

Warren, O.—The Warren Light company is preparing to build a new plant.

Lonaconing, Md.—The Home Electric company is ready to receive bids for its electric plant.

Austell, Ga.—Equipment for an electric light plant is desired by C. J. Shelverton.

Carlyle, Ill.—The construction of an electric light plant is contemplated. F. A. Fietze, engr.

Murray, Ky.—The Murray Milling company desires equipment for an electric light plant. W. P. Gatlin, mgr.

Louisburg, N. C.—Bids will be received for complete equipment for an electric light plant.

Chicago, Ill.—The city council voted, March 13, in favor of municipal ownership of gas and electric lighting and heating plants.

Peoria, Ill.—The People's Gas and Electric company has been organized, and will enter into competition for lighting this city.

Mayville, N. D.—Bids are asked until April 5 for constructing an electric light plant. Samuel Torgesson, cy. audt.

Tarboro, N. C.—The question of issuing bonds for electric or gas lighting will be voted on April 17. J. H. Baker, mayor.

Linton, Ind.—The town trustees have employed a civil engineer to make a survey and plat for a combined electric light and water works plant.

Dayton, O.—Bids are asked until April 10 for furnishing and lighting 300 electric arc lights of 2,000 c. p. for 5 yrs. G. L. Baker, prest. bd. cy, af.

Vincennes, Ind.—Sealed proposals will be received until May 22 for lighting the streets, alleys, parks, public buildings and public places for a period of ten years. Cy. Clk.

Orange, N. J.—The question of installing its own lighting plant is being considered by the city, and suggestions and propositions are invited from engineers and manufacturers as to the approximate cost of the installation and yearly maintenance. John L. Davis, chm.

Baltimore, Md.—The contract for supplying lamps to the street lighting department was awarded March 22 to Thos. T. W. Miner, of New York City, at $3.89 each for a complete lamp. The contract for supplying globes was awarded to Jas. J. Murray & Co., of Philadelphia, at $6.75 a dozen.

Grand Island, Neb.—Arnold C. Koenig, C. E., Arch't, is preparing the plans for the buildings for an electric light and ice manufacturing plant, to be erected in this city for Joehnk-Waldmann company. To be of frame and brick, and will cover about 10,000 sq. ft. of ground.

Franklin, Ind.—The contract for electric lighting was awarded March 8 to W. C. Thompson, the only bidder, at $75 each for 60 arc lights; incandescent lighting, 25 to 35 cts. a month per light, for stores, and 30 cts. each for residences using from one to four and more than ten lights, 20 cts. each.